ENERGY ENGINEERING ANALYSIS PROGRAM

FORT GEORGE G. MEADE
MARYLAND

PHASE III REPORT
VOLUME 1
EXECUTIVE SUMMARY
DECEMBER 15, 1983
REVISED APRIL 19, 1985

CONTRACT NO. DACA 31-82-C-0307
DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT CORPS OF ENGINEERS

Prepared By

Ewing Cole Cherry Parsky
Architects Engineers Interior Designers
Federal Reserve Bank Building, 100 North 6th Street
Independence Mall West, Philadelphia, PA 19106

FORT GEORGE G. MEADE

PHASE III REPORT

VOLUME 1

EXECUTIVE SUMMARY

TABLE OF CONTENTS

SECTION	TITLE	PAGE NO.
1	Introduction	ES-1.1
2	Existing Energy Consumption	ES-2.1
3	Energy Conservation Measures Developed	
	o Basis of Analysis for ECO Evaluation	ES-3.1
	o Energy Conservation Opportunities Investigated	ES-3.2
	o ECIP Projects	ES-3.3
	o Other Projects	ES-3.3
	o Energy Management and Control System	ES-3.4
	o Table 3.1 - General Summary Of Potential Energy Conservation Opportunities	ES-3.9
	o Table 3.2 - Funding Diagram	ES-3.16
	o Table 3.3 - ECIP Projects Summary Table	ES-3.17
4	Energy and Cost Savings	
	o Summary	ES-4.1
	o Table 4.1 - ECIP & Increment F Projects Fuel Savings Summary-MBTU/Y For Each Fuel	ES-4.2
	o Table 4.2 - Increment F and G Projects Fuel Savings MBTU/Yr For Each Fuel	ES-4.3
	o Table 4.3 - Energy Consumption, Cost and Percentages By Fuel Type (ECIP Projects)	ES-4.6
	o Table 4.4 - Energy Consumption, Cost and Percentages By Fuel Type (ECIP and Increment F Projects)	ES-4.7

TABLE OF CONTENTS (CONTINUED)

SECTION	TITLE	PAGE NO.
5	Increment C - Solar	
	o Scope	ES-5.1
	o Results	ES-5.2
	o Supplementary Information	ES-5.3
	o Recommendations	ES-5.3
	o Table 5.1 - Monthly MBTU Load Profile For Typical Buildings	ES-5.4
	o Table 5.2 - SOLFEAS Program Summary	ES-5.5
6	Increment F - Facility Engineer Conservation Measures	
	o Energy Actions by Fort George G. Meade (Tables and Charts Pages ES-6.4 thru ES-6.8)	ES-6.1
	o Increment A, B, C and G Projects	ES-6.3
	o Increment F and G Projects	ES-6.3
	o Table 6.1 - Increment F and G Summary Table	ES-6.9
	o Table 6.2 - Increment F and G Labor and Material Summary	ES-6.12
7	Energy Plan	
	o Recommendations	ES-7.1
	o Projected Energy Savings	ES-7.2

EXECUTIVE SUMMARY

1. INTRODUCTION

Purpose

The Army Energy Plan, established in early 1978, sets both short and long term energy goals for the Army consistent with the Presidential Executive order issued in mid-1977. It directs the Major Army commands to develop detailed implementation plans and funding documents.

The Department of the Army, through the Corps of Engineers Baltimore, has contracted with Ewing Cole Cherry Parsky to provide the Energy Engineering Analysis Program (EEAP) at Fort George G. Meade under contract number DACA31-82-C-0307. The results of the study are indicated in detail in the MAIN REPORT, Volume 2B - Part 2, of the Report. Backup calculations are provided in Volume 4B of the Report.

The purpose of this EXECUTIVE SUMMARY is to summarize the results of the EEAP.

Scope of Work

The increments of work to be provided as stated in the Contract are:

- Increment A: Energy Conservation Investigations for Buildings and Processes. The Facilities Engineering Office at Fort Meade indicated that they would rather have specific information for a selected group of buildings rather

than extrapolated information which they do not believe will be useful to them because of the considerable amount of work that they have already done and are planning to do. As a consequence, with the exception of certain housing and barracks buildings which can be extrapolated, the buildings selected by Fort Meade for study are atypical, and limit the extent of the analysis.

- Increment B: Energy Conservation Investigations of Utilities and energy Distribution Systems, Energy Monitoring and Control Systems (EMCS), and Local Use of Available Waste Fuels in Existing Energy Plants. By Contract, the EMCS analysis for Increment B is limited to a general review of the problems with the existing system and an expression of Ewing Cole Cherry Parsky's opinion on what should be done with existing systems.

- Increment C: Renewable Energy Projects. By Contract, Increment C is limited to solar studies only. Solar studies are not to include space heating or cooling.

- Increment F: Facilities Engineering Conservation Measures

- Increment G: Projects Identified in Increments A & B That Do Not Qualify Under ECIP Criteria

2. EXISTING ENERGY CONSUMPTION

There are a number of factors which affect the development and presentation of historical and projected energy consumption data for the contract. These include:

1. The energy consumption values and areas indicated in the "Installation Facility Energy Plan" do not include the consumption for the NSA buildings and the County Schools, since NSA and the schools are not considered to be part of the "Fort Meade" facilities, but do include consumption and area at Support Activities under the control of Fort Meade at other locations and at 15 U.S. Army Reserve (USAR) Centers. The utility company gas and electric bills for Fort Meade include the separately metered but not separately billed consumption of NSA and the schools.

2. The work under the contract does not include the Support Activities or the USAR Centers under the control of Fort Meade, but does include 4 NSA buildings (P-9801, P-9827, P-9828 and P-9829).

3. With the selection of atypical buildings, building group and typical building energy consumption is not available.

On the basis of discussions with the Department of the Army, Baltimore District, Corps of Engineers, the historical energy consumption shown in this report is the consumption at Fort Meade exclusive of the consumption

for the NSA buildings and the County Schools and exclusive of the consumption for the Support Activities and USAR Centers under the control of Fort Meade. As a consequence, the values indicated do not agree with the "Installation Facility Energy Plan" and also do not include consumption or cost for the individual NSA buildings in the contract, since this latter information is not available.

Additionally, on the basis of discussion with the Department of the Army, Baltimore District, Corps of Engineers, projections of energy consumption and savings resulting from implementation of the recommendations of this report are broken down into two parts. The first part includes all buildings and extrapolations exclusive of the 9800 series (NSA) buildings. The second part covers the 9800 series NSA buildings and extrapolations and provides information of projected savings only, without comparison to historical data, since the latter information is not available for these buildings.

The following tables and figures are based on the previous discussion.

Table 2.1 lists the energy conversion factors for converting fuel consumption units to BTU and MBTU for the purpose of calculating energy savings. This listing is copied from "Energy Conservation Investment Program (ECIP) Guidance", revised 6 August 1983, page 2, paragraph 3a.

Tables 2.2 through 2.9 show the consumption values in fuel units, MBTU and cost for fuels used at Fort Meade for fiscal years 1975, 1980, 1981 and 1982.

Tables 2.10 through 2.13 and their "pies" show the total base-wide energy values based on data from Tables 2.2 through 2.9 for fiscal years 1975, 1980, 1981 and 1982.

Table 2.14 compares the base-wide energy values for fiscal years 1975, 1980, 1981 and 1982 based on information obtained from Tables 2.2 through 2.9. It indicates an overall reduction of 20% in energy consumption for FY82 compared to FY75.

Figures 2-1, 2-2 and 2-3 show graphically the monthly consumption of electricity, natural gas and oil for fiscal years 1975, 1980, 1981 and 1982.

2.1 ENERGY CONVERSION FACTORS

FUEL	FUEL UNIT	CONVERSION FACTOR IN BTU	CONVERSION FACTOR IN MBTU
ELECTRICITY	KWH	11,600 BTU/KWH	0.0116 MBTU/KWH
NATURAL GAS	THERM	100,000 BTU/THERM	0.1000 MBTU/THERM
NATURAL GAS	CCF.	103,100 BTU/CCF.	0.1031 MBTU/CCF.
NO. 2 FUEL OIL	GAL.	138,700 BTU/GAL.	0.1387 MBTU/GAL.
PROPANE	GAL.	95,000 BTU/GAL.	0.0955 MBTU/GAL.
GASOLINE	GAL.	149,700 BTU/GAL.	0.1497 MBTU/GAL.
NO. 2 DIESEL FUEL	GAL.	149,700 BTU/GAL.	0.1497 MBTU/GAL.
AVGAS, JP-4		*	*

2.2 ELECTRICITY

FISCAL YEAR	ANNUAL CONSUMPTION KWH	ANNUAL CONSUMPTION MBTU	PERCENTAGE OF USE 1975	ANNUAL ELECTRIC COSTS	PERCENTAGE OF COST 1975
1975	75,490,399	875,689	100%	*	100%
1980	78,863,922	914,821	104.5	2,622,468	*
1981	79,586,097	923,199	105.4	2,820,639	*
1982	79,493,160	922,121	105.3	3,189,020	*

2.3 NATURAL GAS

FISCAL YEAR	ANNUAL CONSUMPTION CCF	ANNUAL CONSUMPTION MBTU	PERCENTAGE OF USE 1975	ANNUAL GAS COST $	PERCENTAGE OF COST 1975
1975	7,794,474	803,920	100%	*	100%
1980	5,798,668	597,843	74.4	1,808,358	*
1981	5,996,161	618,204	76.9	2,242,716	*
1982	6,055,612	624,333	79.0	2,861,319	*

2.4 NO. 2 FUEL OIL

FISCAL YEAR	ANNUAL CONSUMPTION GAL.	ANNUAL CONSUMPTION MBTU	PERCENTAGE OF USE 1975	ANNUAL OIL COST $	PERCENTAGE OF COST 1975
1975	5,070,264	703,246	100%	*	100%
1980	2,842,834	394,301	53.7	*	*
1981	3,042,367	421,976	57.4	4,168,042	*
1982	2,889,255	400,739	54.5	*	*

*Information not available.

2.5 PROPANE

FISCAL YEAR	ANNUAL CONSUMPTION GAL.	ANNUAL CONSUMPTION MBTU	PERCENTAGE USE OF 1975	ANNUAL PROPANE COST $	PERCENTAGE OF COST 1975
1975	21,442	2,037	100%	*	100%
1980	10,253	974	47.8	*	*
1981	26,368	2,505	123.0	*	*
1982	8,631	820	40.3	*	*

2.6 MOBILITY GASOLINE

FISCAL YEAR	ANNUAL CONSUMPTION GAL.	ANNUAL CONSUMPTION MBTU	PERCENTAGE USE OF 1975	ANNUAL GASOLINE COST $	PERCENTAGE OF COST 1975
1975	684,115	102,412	100%	*	100%
1980	649,519	97,233	94.9	*	*
1981	605,671	90,669	88.5	*	*
1982	565,591	84,669	82.7	*	*

2.7 MOBILITY DIESEL OIL

FISCAL YEAR	ANNUAL CONSUMPTION GAL.	ANNUAL CONSUMPTION MBTU	PERCENTAGE USE OF 1975	ANNUAL DIESEL COST $	PERCENTAGE OF COST 1975
1975	361,910	54,178	100%	*	100%
1980	267,348	40,022	73.4	*	*
1981	250,822	37,548	69.3	*	*
1982	286,266	42,854	79.1	*	*

2.8 MOBILITY AVGAS

FISCAL YEAR	ANNUAL CONSUMPTION GAL.	ANNUAL CONSUMPTION MBTU	PERCENTAGE USE OF 1975	ANNUAL AVGAS COST $	PERCENTAGE OF COST 1975
1975	*	7,318	100%	*	100%
1980	*	2,691	36.8	*	*
1981	*	1,783	24.4	*	*
1982	*	2,850	38.9	*	*

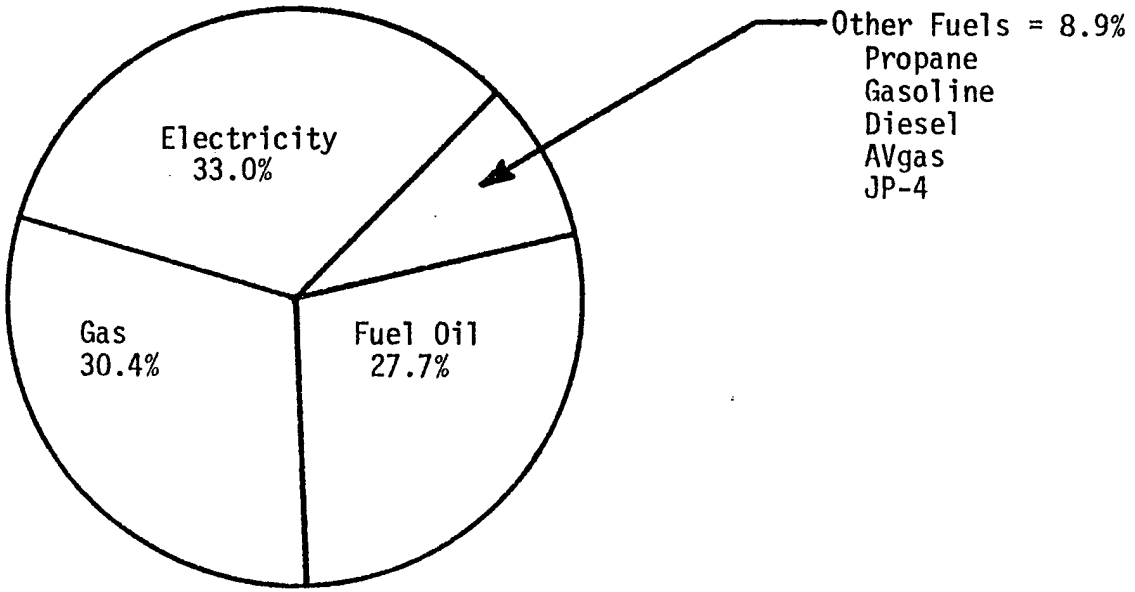
2.9 MOBILITY JP-4

FISCAL YEAR	ANNUAL CONSUMPTION GAL.	ANNUAL CONSUMPTION MBTU	PERCENTAGE USE OF 1975	ANNUAL JP-4 COST $	PERCENTAGE OF COST 1975
1975	*	69,086	100%	*	100%
1980	*	47,808	69.2	*	*
1981	*	49,873	72.2	*	*
1982	*	41,418	60.0	*	*

*Information not available.

2.10 ENERGY CONSUMPTION, COST AND PERCENTAGES BY FUEL TYPE, FY1975

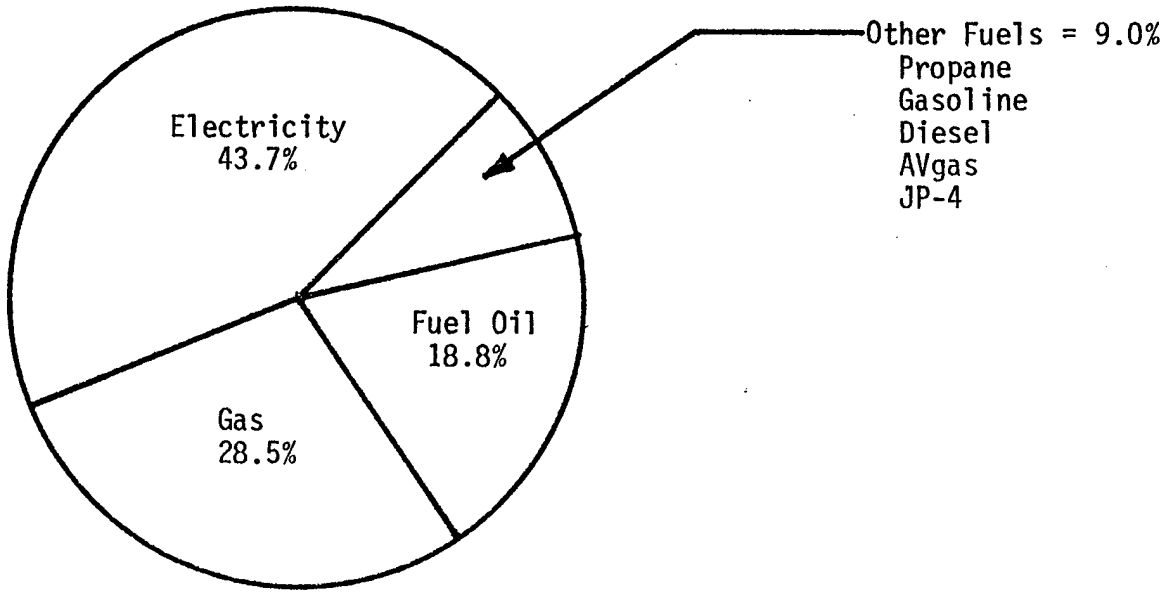
FUEL TYPE	CONSUMPTION IN FUEL UNITS	CONSUMPTION IN SOURCE MBTU	% OF TOTAL CONSUMPTION	$ ENERGY COST	% OF TOTAL COST
Electricity	75,450,399 KWH	875,689	33.0	*	*
Natural Gas	7,794,474 CCF	803,920	30.4	*	*
No. 2 Fuel Oil	5,074,614 GAL	734,927	27.7	*	*
Propane	21,442 GAL	2,037	0.1	*	*
Subtotal-Facilities		2,416,573	91.2		
Mobility Gasoline	684,115 GAL	102,412	3.9	*	*
Mobility Diesel Oil	361,910 GAL	54,178	2.0	*	*
Mobility AVgas	*	7,318	0.3	*	*
Mobility JP-4	*	69,086	2.6	*	*
Subtotal-Mobility		232,994	8.8		
Total		2,649,567	100.0		



*Information not available.

2.11 ENERGY CONSUMPTION, COST AND PERCENTAGES BY FUEL TYPE, FY1980

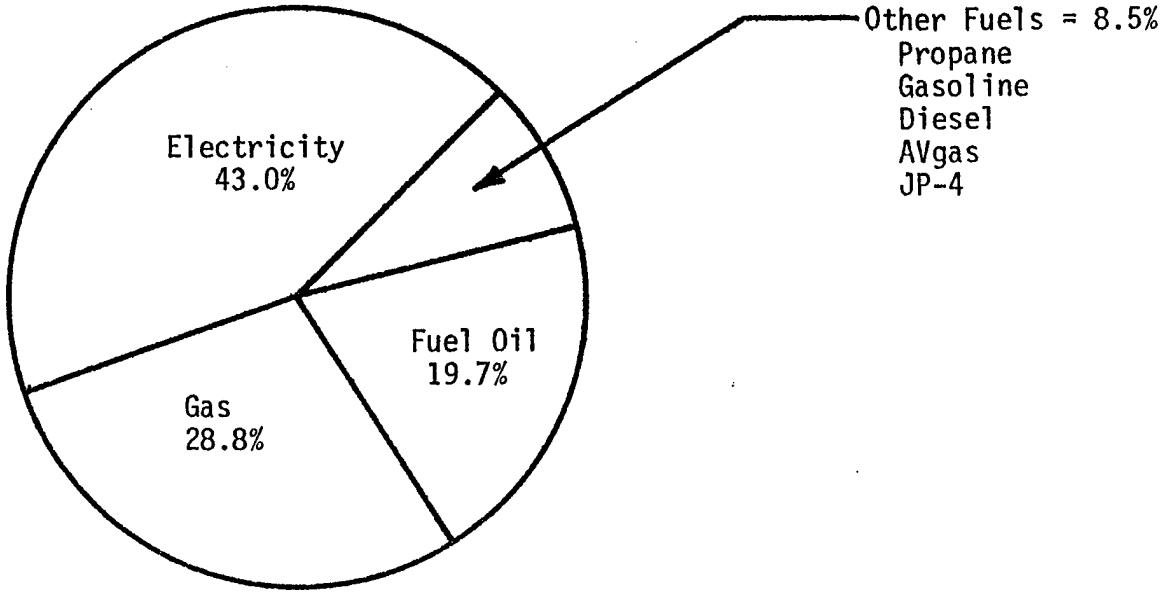
FUEL TYPE	CONSUMPTION IN FUEL UNITS	CONSUMPTION IN SOURCE MBTU	% OF TOTAL CONSUMPTION	$ ENERGY COST	% OF TOTAL COST
Electricity	78,803,922 KWH	914,821	43.7	2,622,468	*
Natural Gas	5,798,668 CCF	597,843	28.5	1,808,358	*
No. 2 Fuel Oil	2,842,834 GAL	394,301	18.8	*	*
Propane	10,253 GAL	974	0.1	*	*
Subtotal-Facilities		1,907,939	91.1		
Mobility Gasoline	649,519 GAL	97,233	4.6	*	*
Mobility Diesel Oil	267,348 GAL	40,022	1.9	*	*
Mobility AVgas	*	2,691	0.1	*	*
Mobility JP-4	*	47,808	2.3	*	*
Subtotal-Mobility		187,754	8.9		
Total		2,095,693	100.0		



*Information not available.

2.12 ENERGY CONSUMPTION, COST AND PERCENTAGES BY FUEL TYPE, FY1981

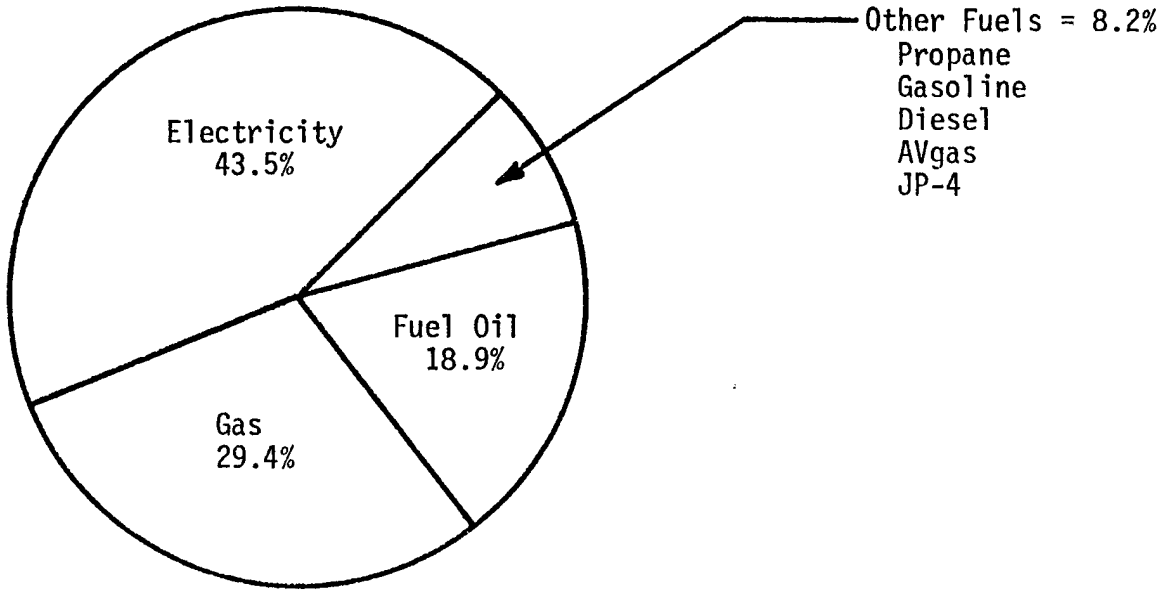
FUEL TYPE	CONSUMPTION IN FUEL UNITS	CONSUMPTION IN SOURCE MBTU	% OF TOTAL CONSUMPTION	$ ENERGY COST	% OF TOTAL COST
Electricity	79,586,097 KWH	923,199	43.0	2,820,639	*
Natural Gas	5,996,161 CCF	618,204	28.8	2,242,716	*
No. 2 Fuel Oil	3,042,367 GAL	421,976	19.7	4,168,042	*
Propane	26,368 GAL	2,505	0.1	*	*
Subtotal-Facilities		1,965,884	91.6		
Mobility Gasoline	605,671 GAL	90,669	4.2	*	*
Mobility Diesel Oil	250,822 GAL	37,548	1.8	*	*
Mobility AVgas	*	1,783	0.1	*	*
Mobility JP-4	*	49,873	2.3	*	*
Subtotal-Mobility		179,873	8.4		
Total		2,145,757	100.0		



*Information not available.

2.13 ENERGY CONSUMPTION, COST AND PERCENTAGES BY FUEL TYPE, FY1982

FUEL TYPE	CONSUMPTION IN FUEL UNITS	CONSUMPTION IN SOURCE MBTU	% OF TOTAL CONSUMPTION	$ ENERGY COST	% OF TOTAL COST
Electricity	79,493,160 KWH	922,121	43.5	3,189,020	*
Natural Gas	6,055,612 CCF	624,333	29.4	2,861,319	*
No. 2 Fuel Oil	2,889,255 GAL	400,739	18.9	*	*
Propane	8,631 GAL	820	0.1	*	*
Subtotal-Facilities		1,948,013	91.9		
Mobility Gasoline	565,591 GAL	84,669	4.0	*	*
Mobility Diesel Oil	286,666 GAL	42,854	2.0	*	*
Mobility AVgas	*	2,850	0.1	*	*
Mobility JP-4	*	41,418	2.0	*	*
Subtotal-Mobility		171,791	8.1		
Total		2,119,804	100.0		



*Information not available.

2.14 ANNUAL TOTAL COMPARISON

FISCAL YEAR	FACILITIES ANNUAL ENERGY MBTU/YR	FACILITIES USE % OF 1975	MOBILITY ANNUAL ENERGY MBTU/YR	MOBILITY USE % OF 1975	TOTAL ANNUAL ENERGY MBTU/YR	TOTAL USE % OF 1975
1975	2,416,553	100.0	232,994	100.0	2,649,567	100.0
1980	1,907,939	79.0	187,754	80.6	2,095,693	79.1
1981	1,965,884	81.4	179,873	77.2	2,145,757	81.0
1982	1,948,013	80.6	171,791	73.7	2,119,804	80.0

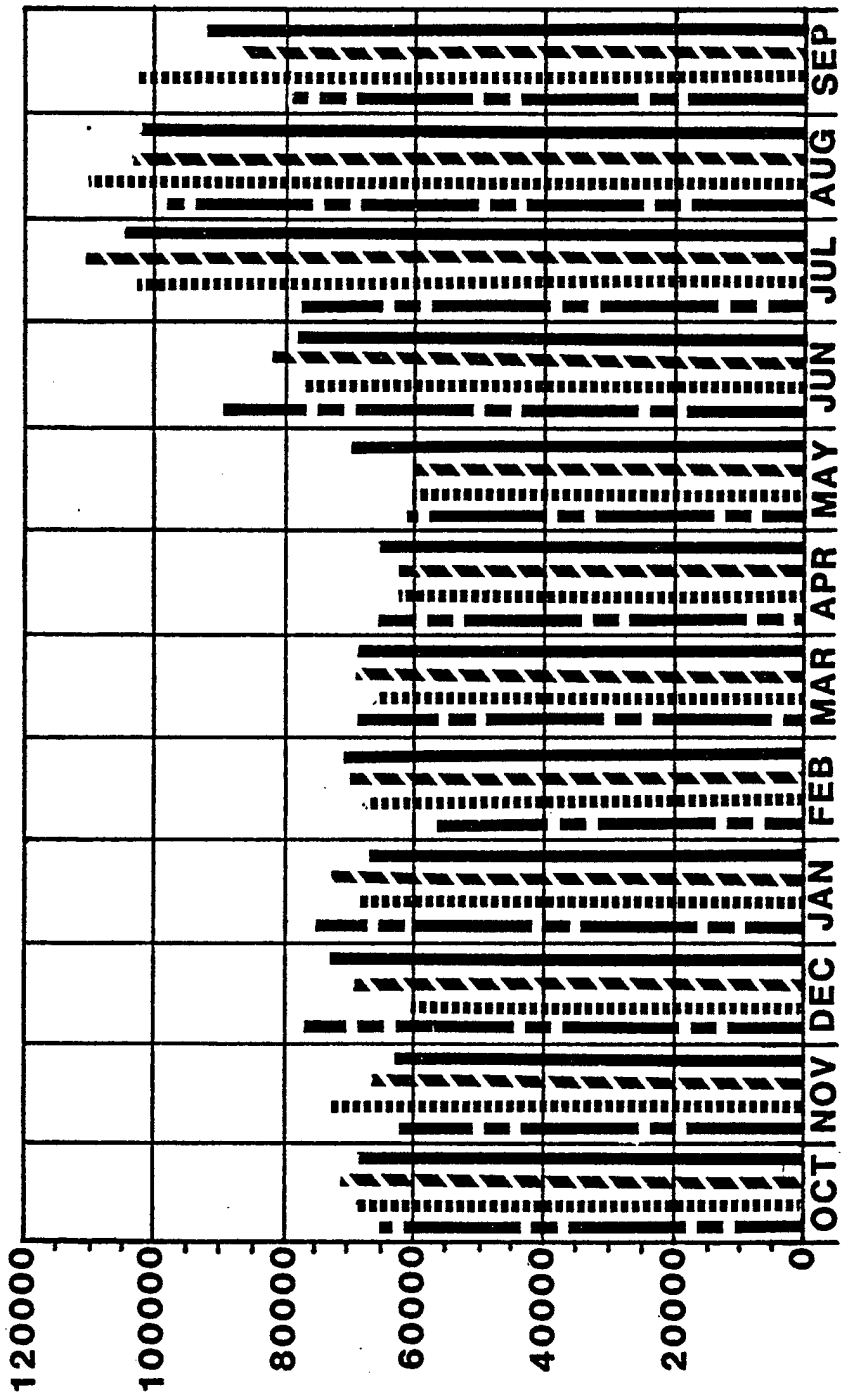


FIGURE 2-1 MONTHLY ELECTRICAL ENERGY USAGE
FY75 FY80 FY81 FY82

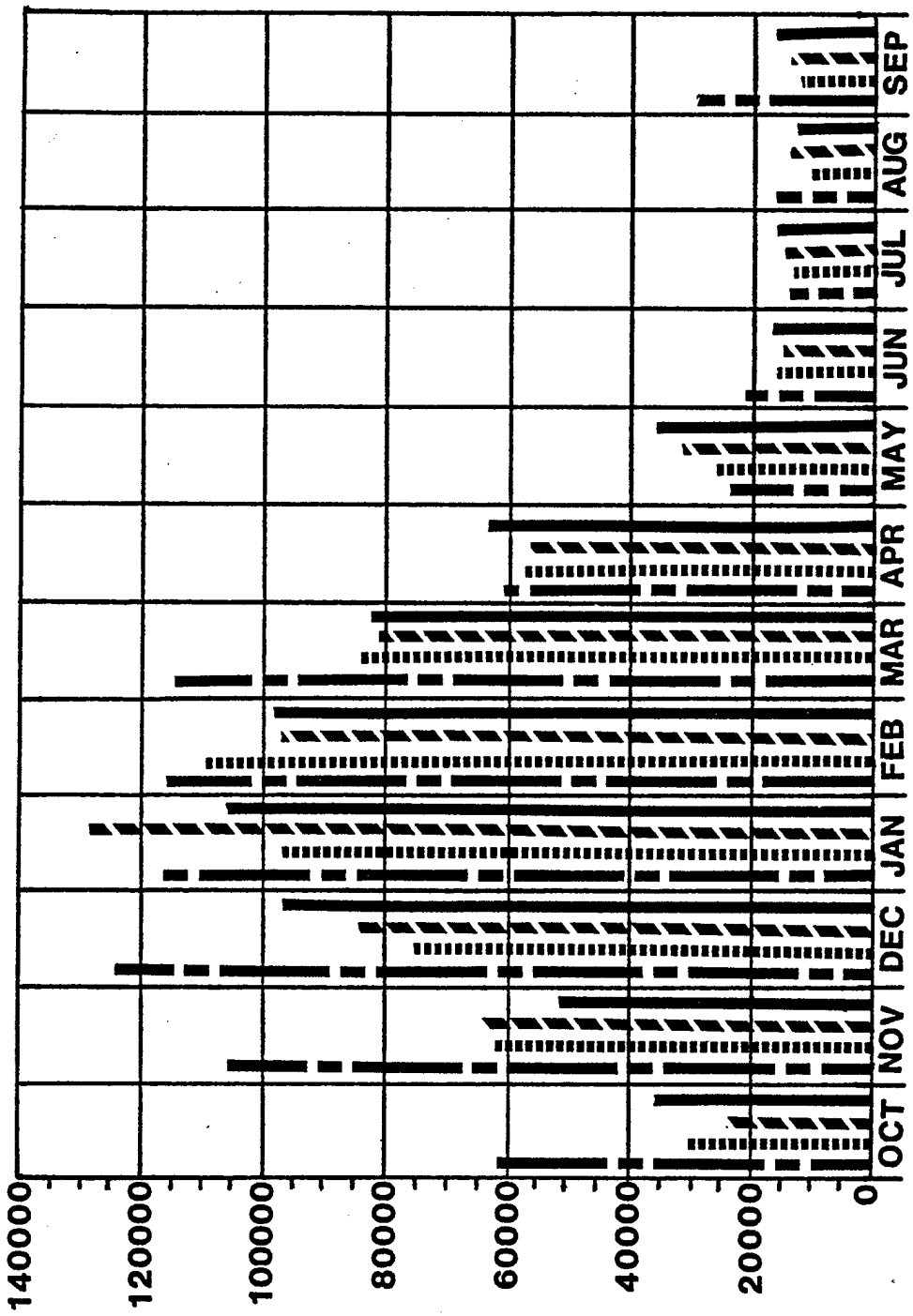


FIGURE 2-2 MONTHLY GAS ENERGY USAGE
FY75 FY80 FY81 FY82

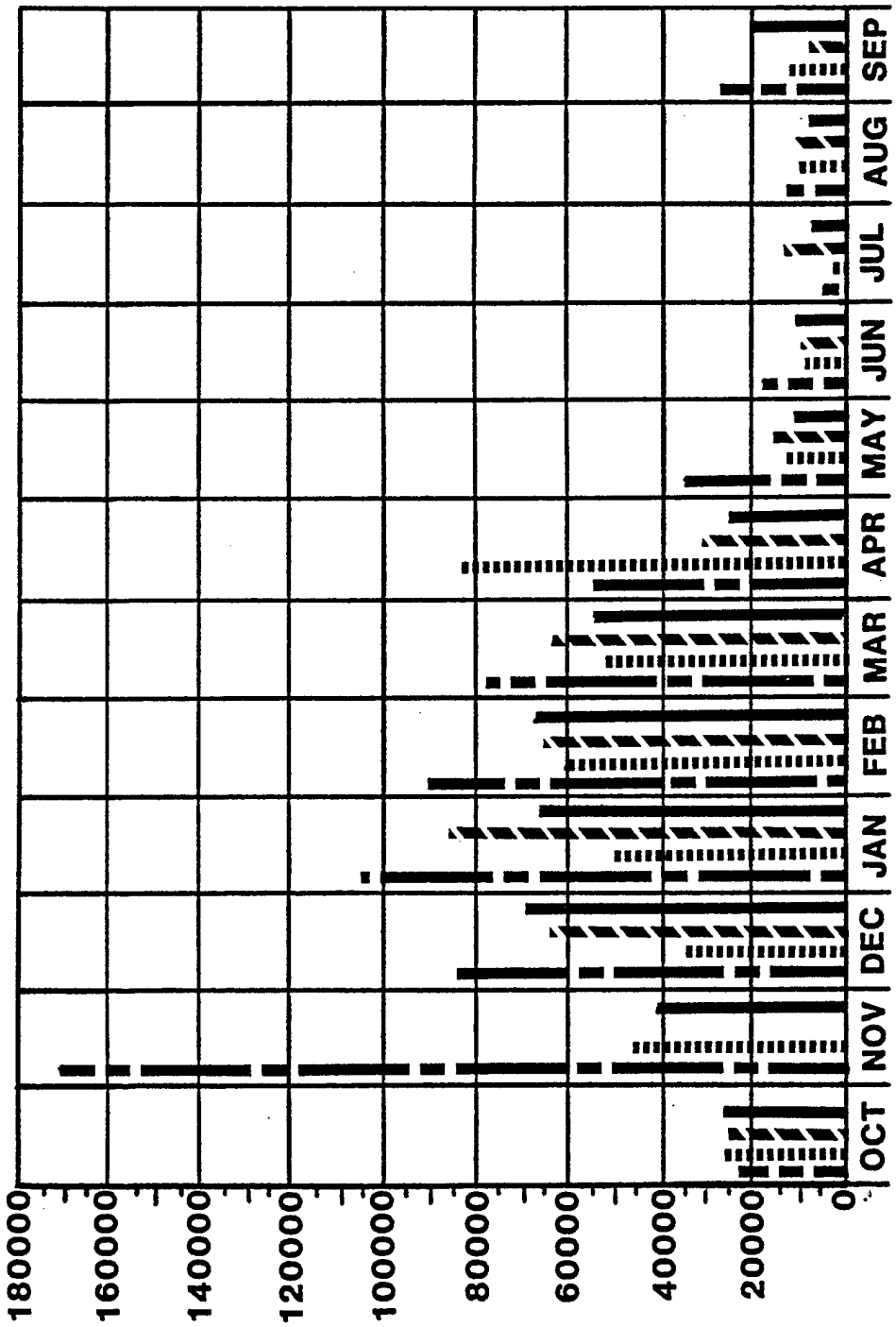


FIGURE 2-3 MONTHLY OIL ENERGY USAGE
FY75 FY80 FY81 FY82

3. ENERGY CONSERVATION MEASURES DEVELOPED

Basis of Analysis for ECO Evaluation

Energy conservation opportunities were evaluated on the basis of letter, DAEN-MPO-U, 10 August 1982, subject: Energy Conservation Investment Program (ECIP) Guidance.

The ECIP Guidance requires that the evaluation be made as follows:

1. Life Cycle Savings to Investment Ratio (SIR)
2. Recommended simplified economic analysis summary format.
3. Present worth factors as tabulated in DAEN-MPO-U.
4. Energy costs and construction costs at the installation on the date of analysis.

Ewing Cole Cherry Parsky wrote a computer program based on the recommended simplified economic analysis summary format. This program is written in BASIC for use on an IBM/PC computer and a printout is included in Volumes 2B - Part 2 and 4B - Section 2 for future use by Fort Meade.

"Date of Analysis" energy costs used in the calculations are estimated fiscal year 1983 values, including values for Baltimore Gas & Electric scheduled rate increases, as obtained from the Chief, Environmental & Control Office, Fort George G. Meade.

Ewing Cole Cherry Parsky has on its staff General Construction, Mechanical and Electrical Engineers with actual contracting experience whose specialty is cost estimating and who were involved in estimating the construction costs. Cost information was obtained from vendors and the R. S. Means Construction Cost Guide where appropriate and cost estimates were established based on experience and judgment for the estimated actual installation conditions for each item. SIOH (Supervision, Inspection and Overhead) and Design Costs were established by the Army at 5% and 6%, respectively, of the construction cost and then the investment cost was calculated in accordance with the requirements of the ECIP Guidelines. (Note: The Interim Submission review comments indicate that SIOH has been revised to 5.5%. By agreement, this change is incorporated only on the 1391 Forms for the PDB's in Volume 3 of the report.)

Energy Conservation Opportunities Investigated

A general summary of Potential Energy Conservation Opportunities developed for the various buildings in the Contract during Phase 1 is attached as Table 3.1.

Energy savings, energy cost savings, installation costs and savings to investment ratio for the various Energy Conservation Opportunities determined during Phase 1, as well as additional items developed during the Phase II work, were calculated using the preceding procedure. More detailed information on the ECO's is also included in Volume 2B - Part 2, Main Report and in Volume 4B, Section 3.

The various qualifying Energy Conservation Opportunities (those with Savings to Investment Ratio, or with Reduced Savings to Investment Ratio as appropriate, greater than or equal to one) were originally catagorized by "construction trade" for the purposes of determining potential ECIP projects. Fort Meade and the Army requested, however, that all items in any building be included in one project and that all applicable items be included in projects. The qualifying items were then organized into cagegories as follows:

E1 Buildings With Major Boiler Work
E2 Housing Units
E3 Buildings With Major Insulation Work
E4 Buildings With Miscellaneous Heating, Ventilating and Air Conditioning and Automatic Temperature Control Work
E5 Solar Energy
6 Increment F Items
7 Items Which Do Not Qualify Under EEAP Program - Increment G

Table 6.3 of the Main Report in Volume 2B - Part 2 shows the results of the qualifying investigations, by category, and includes extrapolations. The categories were analyzed for funding in accordance with Funding Diagram 3.2.

ECIP Projects

Table 3.3 summarizes the recommended ECIP projects, including extrapolated buildings and Increment C.

Other Projects

The dollar value of the category 7 items is not sufficient to warrant separate Increment G projects and these are, therefore, included in Increment F. Table 6.1 of this Executive Summary summarizes the recommended Increment F and G projects.

Energy Management and Control System

The Honeywell CPU installed in 1977 is a back plane wired system using random access memory for the files and operating system. The latest revision is Honeywell REV 1175. This is an all electronic unit and revisions have been made to clean up the software and include all changes or "patches" made over the 1977-1983 period of time.

The following options are available for the new Delta 1000 CPU:

1. Colorographic CRT - This provides interactive graphic displays with normal command and data retrieval functions for an optimum operator interface. The operator has a pictorial representation of the system plus dynamic information on the graphic picture such as fan status, supply air temperature, alarm conditions, return air temperature, pump status, etc.

2. Data Manager System - This is a microprocessor-based historical storage system that enhances the Delta reporting functions. The software is made up of submodules which provide historical storage (trend logs, energy reports or any logging function may be put on the disk for future retrieval) and maintenance management (preventative maintenance work orders based on calendar days, operating time of the equipment and event occurrences).

The Delta 1000 System can be expanded to a Delta 5200 System which is quite similar to the Tri-Service Specification.

The following new technologies can be applied to the existing system as well as current state of the art systems: Direct Digital Control, Fiber Optics and FM Radio Control.

The Honeywell Delta 1000 EMCS is a viable system and can provide significant energy savings. It requires, as does any large, sophisticated EMCS, periodic updating, and constant preventative and corrective maintenance, and this should be provided. It can be expanded and it is recommended that this be done, as appropriate, to improve its usefulness.

The existing CPU should be retrofitted or replaced to include current electronics and software changes and patches made over the 1977 - 1983 period of time. Budget $35,000 to $40,000.

When new buildings are constructed, or existing buildings are altered, consideration should be given to the use of DDC rather than conventional automatic temperature controls. For sophisticated control systems, DDC may be less costly than conventional systems. For any event, DDC reduces the cost of connection to the EMCS and provides local management - distributive processing - functions.

Recommendations for improved utilization are as follows:

1. Optimum Start/Stop was not included in the original implementation but Fort Meade has begun the process of using this system capability. This process should be expedited so that all heating and air conditioning systems under control of the EMCS utilize this feature of the system.

2. Load reset and reheat reduction were not included in the original implementation. There are no reheat systems under the control of the EMCS. Load reset for water chillers, boilers and heating systems should be implemented through the EMCS for the buildings which are under the control of the EMCS if appropriate.

3. Enthalpy control was not included in the original implementation and is not recommended by the Corps of Engineers because their experience is that maintenance costs are too high.

4. Electrical demand control was included in the original implementation. For fiscal year 1982, electrical demand charges were $2,636,173 or 24.4% of the total electrical costs for Fort Meade and NSA. Implementation of additional demand control through the EMCS should be cost effective.

The EMCS is monolithic and any failure of the CPU affects the entire system. Special expertise is required to maintain the CPU and it should be updated as newer versions become available. It is recommended, therefore, that Fort Meade arrange for maintenance of the CPU through a maintenance contract with the manufacturer's (Honeywell) service organization and that the contract include updating of the CPU.

The balance of the system also requires periodic preventative and corrective maintenance. This maintenance can be accomplished by any one, or a combination, of the following three methods.

1. Fort Meade personnel
2. Contract with an independent service organization
3. Contract with the manufacturers' (Honeywell) service organization

Method No. 1 is dependent upon Fort Meade's capability of hiring and keeping qualified personnel. If this can be accomplished, this method will have the lowest cost to Fort Meade.

Method No. 2 is dependent upon being able to find a capable independent service organization and, if so, would probably be more expensive than Method No. 1 and less expensive that Method No. 3.

Method No. 3 is probably the most costly method. It is recommended, however, that Fort Meade consider using Method No. 3, in conjunction with retrofitting of the CPU, for a period of one year for the purpose of modernizing the system and placing it in an operating condition that will provide reliable monitoring and energy management. After this initial year, the contract with Honeywell should be renewed for the CPU and maintenance Method No. 1, No. 2, or No. 3 should be implemented for the balance of the system as Fort Meade deems appropriate.

The Data Manager System and Colorographic CRT have the potential for saving labor and improving maintenance but may not be cost effective.

Fort Meade should consider expanding the EMCS to all buildings which have energy cost avoidances that will justify the installation cost.

Reliance on manual energy management functions is risky because of the potential for human error or negligence. Time clocks can be effective, but they require resetting after every power failure and sometimes require seasonal resetting, both of which are manual functions. Installation of time clocks with energy management functions other than on/off approaches or exceeds the cost of connecting to the EMCS.

The budget price for installing a data gathering panel to control one point is approximately $2000. This type of expansion is justifiable when the energy cost avoidance is $400 or more per year. The budget price for each additional control point on the panel is $400 and is justifiable for each additional control point that has an annual energy cost avoidance of $80.

Radio frequency control can be used for expansion to serve smaller buildings and systems. The initial installation would be justifiable if sufficient control points can be found that will provide an annual energy cost avoidance of $1000. Additional control points can then be added if their cost avoidance is $65 or more per year.

Expansion to the Delta 5200 configuration does not appear to be appropriate at the present time.

3.1 GENERAL SUMMARY OF POTENTIAL ENERGY CONSERVATION OPPORTUNITIES
3.1.1 BUILDING ENVELOPE

C Implemented, Planned or Studied by Fort Meade
X Potential ECO applicable to building

BUILDING NO.	P-90	P-90 BH	P-370	T-504	T-618	P-726	P-1644	P-1837	P-1978	P-2239	P-2246	T-2250	P-2251	P-2257	T-2276	P-2480	P-2482	P-2490	P-2692	P-2793	P-3073	P-4215	P-4216	P-4217	P-4247	P-4272	P-4411	P-4415	P-4431	P-4432	P-4523	P-4550	P-4551	P-4552	P-4553	P-4554	P-4700	P-4705	P-6330	P-7100	P-7338	P-7638	P-8452	P-8472	P-8481	P-8484	P-8605	P-8688	P-9801	P-9827	P-9828	P-9829
WALL INSULATION	C		X	C	C	C		X	C	C	C X	C		X	X	C		C	C	C	C	C	X	X	C	C	C	C	C	C	X	C	C	C	C	C	C	C	C	C	X		X	C	C	X	X	X	
ROOF INSULATION											C	C								C					C												C			C	C						C	C	C	
CEILING INSULATION	C			C	C	C		C	C	C	C X			C	X	C		C	C		C	C	C	C	C	C	C	C	C	C X	C	C	C	C	C	C		C	C	C		C	C	C	C		C	C	C
FLOOR INSULATION	C			C		C				C					X						C	C				C	C	C	C	C		C	C	C	C	C	C	C	C				C		X	C	C	C
WEATHERSTRIPPING	C		C	C	C	C		C	C	C	C X	X		C	X	C	C	C	C		C	C	C	C	C X	C	C	C	C		C	C	C X	C	C	C	C	C	C	C	X	X	C X	C		C	C	C X	C	C	C
STORM WINDOWS	C		C	C	C	C		C		C	C	X		C	C	C	C	C	C		C	C	C	C	C	C	C	C	C		C	C	C	C	C	C	C	C	C	C	X	C	C		C		C	C	C	C	C
STORM DOORS								C			C	X													C											C																
DOUBLE GLAZING									C											C																									C				C	C	
SOLAR FILM	X									X	X			X				X				X	X	X				X		X	X	X	X	X	X							X				X	X	X	
VESTIBULES			X															X															X																		
DOCK SEALS												C			X										X																												

Note: Blank spaces indicate that ECO was investigated but found to be not applicable for the building.

3.1.2 ELECTRICAL - LIGHTING & POWER

C Implemented, Planned or Studied by Fort Meade
X Potential ECO applicable to building

BUILDING NO.	P-90	P-90 BH	P-370	T-504	T-618	P-726	P-1644	P-1837	P-1978	P-2239	P-2246	T-2250	P-2251	P-2257	T-2276	P-2480	P-2482	P-2490	P-2692	P-2793	P-3073	P-4215	P-4216	P-4217	P-4247	P-4272	P-4411	P-4415	P-4431	P-4432	P-4523	P-4550	P-4551	P-4552	P-4553	P-4554	P-4700	P-4705	P-6330	P-7100	P-7338	P-7638	P-8452	P-8472	P-8481	P-8484	P-8605	P-8688	P-9801	P-9827	P-9828	P-9829
REDUCE LIGHTS									X					X				X				X	X	X			X					X				X						X									
EFFICIENT LAMPS/FIXTURES	X	X	X	X	X		X		C	X		C X	X		X	X		X		X		X	X	X			X		X	X	X	X		X	X	X	X	X	X				X	X		X	X	X	X	X	X
DEMAND CONTROL																										X			X										X															
HIGH EFFICIENCY MOTORS	X	X	X	X					X	X				X		X		X		X		X	X	X		X	X		X	X	X	X	X	X	X	X	X	X		X			X	X	X	X	X		X	X	X	X
REPLACE LIGHTING				X				X		X	C				X		X		X		X				X		X	X						X		C				X	X		X	X					X	X	X	
DIMMER CONTROL			C																																																		
LIGHTING MODIFICATIONS											C																																											

Note: Blank spaces indicate that ECO was investigated but found to be not applicable for the building.

3.1.3 HEATING SYSTEMS

C Implemented, Planned or Studied by Fort Meade
X Potential ECO applicable to building

BUILDING NO.	P-90	P-90 BH	P-370	T-504	T-618	P-726	P-1644	P-1837	P-1978	P-2239	P-2246	T-2250	P-2251	P-2257	T-2276	P-2480	P-2482	P-2490	P-2692	P-2793	P-3073	P-4215	P-4216	P-4217	P-4247	P-4272	P-4411	P-4415	P-4431	P-4432	P-4523	P-4550	P-4551	P-4552	P-4553	P-4554	P-4700	P-4705	P-6330	P-7100	P-7338	P-7638	P-8452	P-8472	P-8481	P-8484	P-8605	P-8688	P-9801	P-9827	P-9828	P-9829
OXYGEN ANALYZER		X					X						X				X																										X									
ECONOMIZER													C				X																												C									
BOILER BLOW DOWN													X				X																												X									
TURBULATORS							X						X	X																					X																					
CONDENSATE RETURN																																								X						C									
CAPTURE WASTE HEAT		X					X						X				X																												X									
VENT DAMPER	C				C	C	C			C									X		X	C	C	C	X	C	C	C	C	C	X	C	C	C	C	C	C	C	C	C	X	X			X									
REPLACE/REPAIR BOILER		X		C																					X	C		C			X		C				C					C											
RADIATOR CONTROL VALVES	X			C	C									X									C				C						C	C	C	C														C				
INSULATE STEAM LINES												C			X																															X									
REPLACE/REPAIR BURNER		X											X				X			C																									X									

Note: Blank spaces indicate that ECO was investigated but found to be not applicable for the building.

3.1.4 COOLING SYSTEMS

C Implemented, Planned or Studied by Fort Meade
X Potential ECO applicable to building

BUILDING NO.	P-90	P-90 BH	P-370	T-504	T-618	P-726	P-1644	P-1837	P-1978	P-2239	P-2246	T-2250	P-2251	P-2257	T-2276	P-2480	P-2482	P-2490	P-2692	P-2793	P-3073	P-4215	P-4216	P-4217	P-4247	P-4272	P-4411	P-4415	P-4431	P-4432	P-4523	P-4550	P-4551	P-4552	P-4553	P-4554	P-4700	P-4705	P-6330	P-7100	P-7338	P-7638	P-8452	P-8472	P-8481	P-8484	P-8605	P-8688	P-9801	P-9827	P-9828	P-9829
REVISE CONTROLS																											X					X											X									X
RESET CHILLED WATER TEMP.														X		X		X		X		X	X	X			X	X				X	X	X				X		X			X				X		X	X		
MODIFICATIONS TO A/C SYSTEMS																X																				C																
REPAIR/REPLACE COOLING TOWER																																				X																
REDUCE OUTSIDE AIR																																						X														X	

Note: Blank spaces indicate that ECO was investigated but found to be not applicable for the building.

3.1.5 CONTROL SYSTEM

C Implemented, Planned or Studied by Fort Meade
X Potential ECO applicable to building

BUILDING NO.	P-90	P-90 BH	P-370	T-504	T-618	P-726	P-1644	P-1837	P-1978	P-2239	P-2246	T-2250	P-2251	P-2257	T-2276	P-2480	P-2482	P-2490	P-2692	P-2793	P-3073	P-4215	P-4216	P-4217	P-4247	P-4272	P-4411	P-4415	P-4431	P-4432	P-4523	P-4550	P-4551	P-4552	P-4553	P-4554	P-4700	P-4705	P-6330	P-7100	P-7338	P-7638	P-8452	P-8472	P-8481	P-8484	P-8605	P-8688	P-9801	P-9827	P-9828	P-9829
NIGHT SETBACK	X	X	X	X		X	X	X	C		C	C	C		C				X	X	X	X	X	X	C	X				X	C					C	X		C	X	X	C				X		X	X	X	
START/STOP - EMCS	C	C	C	C			C			C	C			C						C		C	C	C		C	C		C	C		C	C	C	C	C		C	C	C				C	C		C	C	C	C
ECONOMIZER CYCLE	X			X						X	X					X											X		X	X		X	X	X	X	X						X	X			X		X			X
EXHAUST FAN CONTROL	X										C																																	X								
ZERO BAND THERMOSTAT	X		X																	X								X			X						X						X				X		X	X	X	
BOILER RESET CONTROL		C				X	C					C	C																																							
SHUTDOWN CONTROLS		C					C																																														
TIME CLOCKS				C	C	C				C		C		C				C				C	C	C			C	C	C	C		C	C	C	C	C			C				C	C	C	C	C	C	C	C
ADJUST CONTROLS										X	X									X								X		X		X	C		C				X												
DUTY CYCLING FANS																C																																					

Note: Blank spaces indicate that ECO was investigated but found to be not applicable for the building.

3.1.6 DOMESTIC HOT WATER SYSTEM

C Implemented, Planned or Studied by Fort Meade
X Potential ECO applicable to building

BUILDING NO.	P-90	P-90 BH	P-370	T-504	T-618	P-726	P-1644	P-1837	P-1978	P-2239	P-2246	T-2250	P-2251	P-2257	T-2276	P-2480	P-2482	P-2490	P-2692	P-2793	P-3073	P-4215	P-4216	P-4217	P-4247	P-4272	P-4411	P-4415	P-4431	P-4432	P-4523	P-4550	P-4551	P-4552	P-4553	P-4554	P-4700	P-4705	P-6330	P-7100	P-7338	P-7638	P-8452	P-8472	P-8481	P-8484	P-8605	P-8688	P-9801	P-9827	P-9828	P-9829
FLOW RESTRICTORS	C		C	C	C	C		C	C	C	C	C		C	C	C		C	C	C	C				C		C	C	C	C	C	C	C	C	C	C		C	C	C	C	C	C	C		C	C	C	C	C	C	C
BOOSTER HEATER DISHWASHER			C																																																	
MODIFY CONTROLS				X	C		C				C																												X	X												
REPLACE D.H. HEATERS																										C																											
MODIFICATION- PLUMBING SYSTEMS																																				C																
HEAT PUMP																																																X					

Note: Blank spaces indicate that ECO was investigated but found to be not applicable for the building.

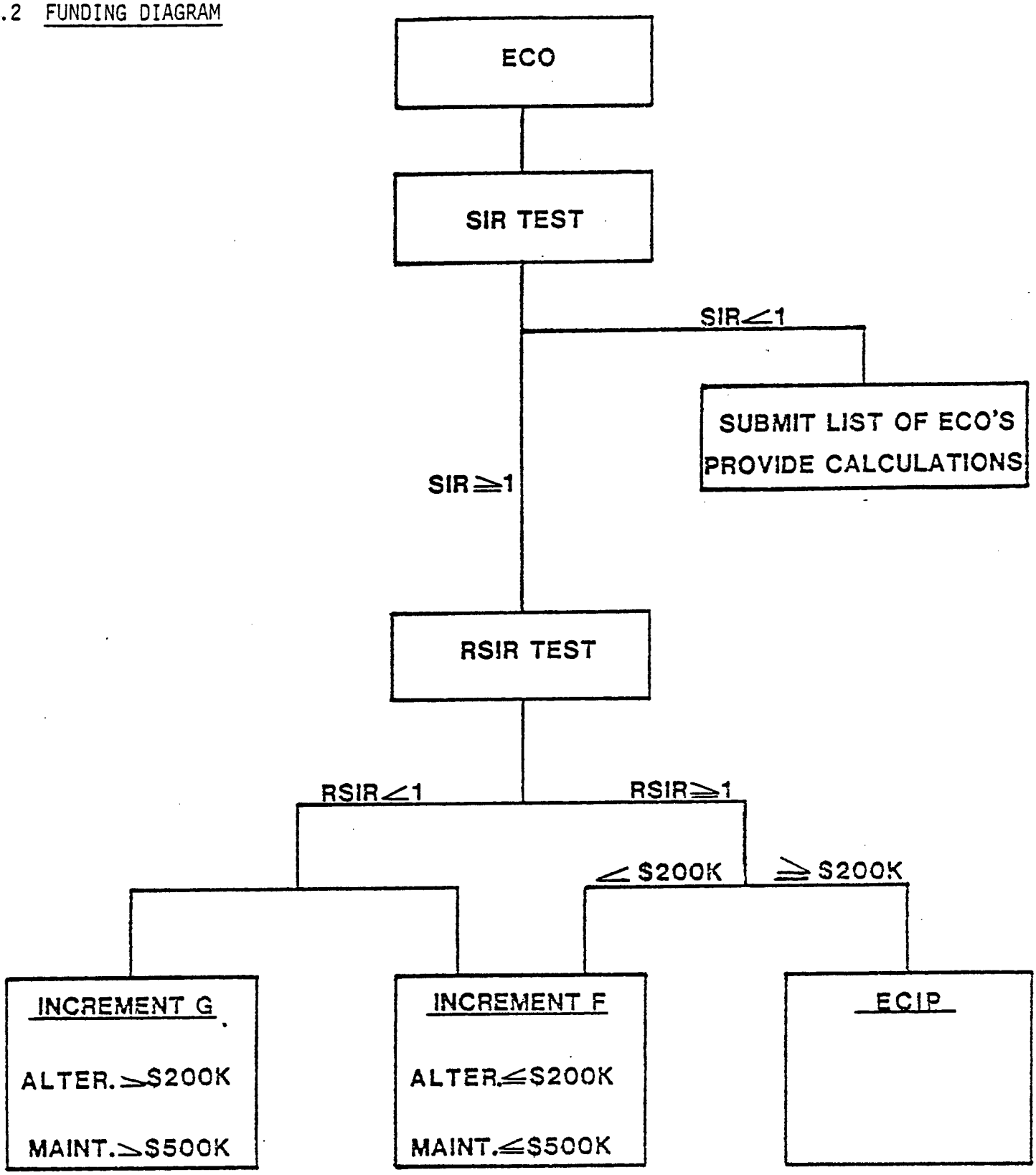
3.1.7 MISCELLANEOUS

C Implemented, Planned or Studied by Fort Meade
X Potential ECO applicable to building

BUILDING NO.	P-90	P-90 BH	P-370	T-504	T-618	P-726	P-1644	P-1837	P-1978	P-2239	P-2246	T-2250	P-2251	P-2257	T-2276	P-2480	P-2482	P-2490	P-2592	P-2793	P-3073	P-4215	P-4216	P-4217	P-4247	P-4272	P-4411	P-4415	P-4431	P-4432	P-4523	P-4550	P-4551	P-4552	P-4553	P-4554	P-4700	P-4705	P-6330	P-7100	P-7338	P-7638	P-8452	P-8472	P-8481	P-8484	P-8605	P-8688	P-9801	P-9827	P-9828	P-9829
DESTRATIFICATION	C										C	C			X																													X							
HEAT RECOVERY										X		C				C										C																		C							C
ISOLATION VALVES												C																																							
ADD ATTIC EXHAUST FAN														C																																						
REPLACE LAB HOODS																																											C								
DECENTRALIZE BOILER										X	C																																C								
SOLAR SYSTEM HEATING												C																																								

Note: Blank spaces indicate that ECO was investigated but found to be not applicable for the building.

3.2 FUNDING DIAGRAM



3.3 ECIP PROJECTS SUMMARY TABLE

PROJECT NO.	ENERGY CONSERVATION MEASURE	TOTAL PROJECT COST ($)	INVESTMENT COST ($)	ANNUAL ENERGY SAVINGS (MBTU/YR)	FIRST YEAR COST SAVINGS ($)	TOTAL DISCOUNTED SAVINGS ($)	NON-ENERGY DISCOUNTED SAVINGS($)	SIR	REDUCED SIR
E-1	Buildings With Major Boiler Work	858,690	772,822	27,930	265,364	3,994,631	-21,660	5.17	-
E-2	Housing Units	786,211	707,590	19,894	122,776	2,283,338	-80,578	3.23	-
E-3	Buildings With Major Insulation Work	1,026,883	924,195	8,035	60,200	1,031,798	8,470	1.12	-
E-4	Buildings With Miscellaneous HVAC and ATC Work	617,627	555,864	28,123	135,905	1,818,624	33,184	3.27	-
E-5	Solar Energy	541,830	487,647	5,920	32,862	702,546	-	1.44	-

3.3 ECIP PROJECT SUMMARY TABLE (CONTINUED)

DETAILED DESCRIPTION OF ECIP PROJECTS

ECIP PROJECT	DESCRIPTION	BUILDINGS
E-1	Buildings With Major Boiler Work	
	Boiler Oxygen Controls	P90BH, P2251, P2482
	Preheat Combustion Air	P90BH, P2251, P2482, P8481
	Boiler Turbulators	P90BH, P2251
	High Efficiency Motor Replacement	P90BH
	Night Setback/Setup	P90
	Economizer Cycle	P90
	Limit Infiltration Hanger Doors	P90
	Zero Energy Band Thermostat	P90
	Thermostatic Control of Fans	P90
	Repair Stack Dampers	P2251, P8481
	Blow Down Heat Recovery	P2251, P2482, P8481
	Stack Economizers	P2482
	Replace Burners	P2482, P8481
	Replace Incandescent Lighting	P2482, P8481
	Decentralized Summer Domestic Hot Water	P8481
E-2	Housing Units	
	Boiler Oxygen Controls	P1644, P1643 Extrapolated
	Preheat Combustion Air	P1644, P1643 Extrapolated
	Boiler Turbulators	P1644, P1643 Extrapolated
	Night Setback/Setup	P1644, P1643 Extrapolated

3.3 ECIP PROJECT SUMMARY TABLE (CONTINUED)

ECIP PROJECT	DESCRIPTION	BUILDINGS
E-2	Housing Units (CONTINUED)	
	Night Setback/Setup	P3073C + 199 Extrapolated Apartments
	Vent Dampers - Boiler or Furnace and Water Heater	P3073C + 199 Extrapolated Apartments P4247 + 29 Extrapolated Buildings P4523 + 27 Extrapolated Buildings
	Storm Windows	P4247 + 29 Extrapolated Buildings P7638B + 75 Extrapolated Apartments
	Weatherstripping and Caulking	P4247 + 29 Extrapolated Buildings P7338 + 209 Extrapolated Apartments P7638B + 75 Extrapolated Apartments
	Boiler Replacement	P4247 + 29 Extrapolated Buildings P4523 + 27 Extrapolated Buildings
	Insulation - Garage Ceiling	P4523 + 27 Extrapolated Buildings
	Insulation - Garage Wall	P4523 + 27 Extrapolated Buildings
	Replace Kitchen Exhaust Damper	P7338F + 30 Extrapolated Apartments
	Replace Attic Fan Louvers	P7338F + 30 Extrapolated Apartments
E-3	Buildings With Major Insulation Work	
	Insulation - Outside Wall Exterior Surface	P8472
	Insulation - Outside Wall Interior Surface	P9801 + P9802, P9803, P9804 Extrapolated
	Modify Controls - Shut Off OA On Warmup	P8472
	High Efficiency Motor Replacement	P9801 + P9802, P9803, P9804 Extrapolated
	Chiller Reset Controls	P9801 + P9802, P9803, P9804 Extrapolated

3.3 ECIP PROJECT SUMMARY TABLE (CONTINUED)

ECIP PROJECT	DESCRIPTION	BUILDINGS
E-4	Buildings With Miscellaneous HVAC and ATC Work	
	Economizer Cycle	T504, P4551, P4700
	Night Setback/Setup	T608, T726 + 20 Extrapolated Buildings P2490, P4272, P4705
	Insulation - Piping	T726 + 20 Extrapolated Buildings
	Insulation - Ductwork	T726 + 20 Extrapolated Buildings
	Revise Controls - 48-hr. Timer	T726 + 20 Extrapolated Buildings
	Modify Controls - Shut off OA on Warmup	P2239, P4552, P4554 P8452, P9829
	Summer Steam Boiler	P2239
	Boiler Turbulators	P2239, P2257, P4554, P7100
	Solar Film	P2257 (Barracks), P4705, P7100, P8452
	Radiator Controls	P2257, P4553, P4554
	Chiller Reset Controls	P2257, P2480, P2490, P4215, P4411, P4550, P4705, P7100, P8605 + 10 Extrapolated Buildings, P9827, P9828
	High Efficiency Motor Replacement	P2480, P2490, P4205, P4272, P4550, P6330, P7100, P8605 + 10 Extrapolated Buildings, P9827, P9828, P9829
	Control Domestic Hot Water Pump	P6330, P9829
	Reduce CFM/Shutoff on Unoccupied	P2480
	Chiller Heat Recovery	P2480
	Reduce OA, Unoccupied & Warmup	P6330

3.3 ECIP PROJECT SUMMARY TABLE (CONTINUED)

ECIP PROJECT	DESCRIPTION	BUILDINGS
E-4	Buildings With Miscellaneous HVAC and ATC Work (CONTINUED)	
	Zone Dampers to Separate Emergency and Pharmacy	P2480
	Exhaust to Make Up Air Heat Recovery	P6330
	Decentralize Hot Water	P7100
	Weatherstripping and Caulking	P8452
	Exhaust Fan Time Clocks	P8452
	Zero Energy Band Thermostats	P8452, P9827
E-5	Solar Energy - Domestic Hot Water	
	Barracks Building	P8605 + Extrapolated Buildings: (P8478, P8479, P8543, P8544, P8545, P8606, P8607, P8609, P8610, P8611, P9801, P9802, P9803, P9804, P9827, P9828)
	Other Buildings	T2250, P2480, P6330

4. ENERGY AND COST SAVINGS

Summary

The following Tables 4.1 through 4.4 summarize the potential energy savings. These indicate that for the Fort Meade facilities there is a potential savings of 78,543 MBTU per year if all of the ECIP projects are implemented and 30,384 MBTU per year if all of the Increment F projects are implemented, with a grand total potential savings of 108,927 MBTU per year. These savings, coupled with the savings that were previously established as noted by comparing FY82 data with base year FY75 data, together with projected savings of 94,770 MBTU per year for ECIP projects under construction, indicate that the goal savings of 20% will be exceeded by 6.8% if all of the projects are implemented.

The Tables also indicate that for the NSA Buildings surveyed, and their extrapolations, there is a potential savings of 11,358 MBTU per year if the ECIP projects are implemented and 6,518 MBTU per year if the Increment F projects are implemented, with a grand total potential savings of 17,876 MBTU per year.

4.1 ECIP & INCREMENT F PROJECTS FUEL SAVINGS SUMMARY-MBTU/Y FOR EACH FUEL

ECIP Projects	ELECTRIC	GAS	OIL	TOTAL
E-1 Buildings with Major Boiler Work	F 2,916	F(-)15,212	F 40,226	F 27,930
E-2 Housing Units	F 0	F 15,916	F 3,979	F 19,895
E-3 Buildings With Major Insulation Work				
Buildings Other Than 9800 Buildings	F 14	F 0	F 228	F 242
9800 Buildings	N 1,689	N 0	N 6,104	N 7,793
E-4 Buildings With Miscellaneous HVAC and ATC Work				
Buildings Other Than 9800 Buildings	F 14,305	F 6,312	F 5,944	F 26,561
9800 Buildings	N 990	N 0	N 570	N 1,560
E-5 Solar Energy				
Buildings Other Than 9800 Buildings	F 0	F 1,393	F 2,522	F 3,915
9800 Buildings	N 0	N 0	N 2,005	N 2,005
Sub Totals Fort Meade	17,235	8,409	52,899	78,543
Sub Totals NSA Buildings	2,679	0	8,579	11,358
Totals ECIP Projects	19,914	8,409	61,578	89,901
Increment F and G Projects				
Totals Fort Meade	13,681	5,983	10,720	30,384
Totals NSA Buildings	4,235	0	2,283	6,518
Totals Increment F and G	17,916	5,983	13,003	36,902
Grand Totals				
Sub Totals Fort Meade	30,916	14,392	63,619	108,927
Sub Totals NSA Buildings	6,914	0	10,962	17,876
Grand Totals	37,830	14,392	74,581	126,803

F = Totals Fort Meade N = Totals NSA Buildings

4.2 INCREMENT F AND G PROJECTS FUEL SAVINGS MBTU/YR FOR EACH FUEL

PROJECT NO.	ENERGY CONSERVATION MEASURE	TOTAL PROJECT COST ($)	INVESTMENT COST ($)	ANNUAL ENERGY SAVINGS (MBTU/YR)	ELECTRIC		GAS		OIL		TOTAL	
					F	N	F	N	F	N	F	N
F-1	Reduce Domestic Hot Water Setpoint Buildings 370 and 8605 + 10 Extrapolated Buildings	192	168	1,881	-	-	-	-	1,881	-	1,881	-
F-2	Piping Insulation Building 8472	47	42	79	-	-	-	-	79	-	79	-
F-3	Adjust Controls To Reduce Overheating Buildings 2239, 2246, 4411 (not accurately quantifiable)	199	178	443	-	-	103	-	340	-	443	-
F-4	Repair Burners Building 90BH	832	749	1,144	-	-	-	-	1,144	-	1,144	-
F-5	Repair Leaks, Condensate Pump Building 8605	555	500	357	-	-	-	-	357	-	357	-
F-6	Seal Kitchen Exhaust Damper Apartment 1837F + 100 Extrapolated Apartments	2,626	2,424	3,376	-	-	3,376	-	-	-	3,376	-
F-7	Reduce Outside Air, Rebalance, Building 8605 + 10 Extrapolated Buildings	6,720	6,039	4,610	2,104	-	-	-	2,506	-	4,610	-
F-8	Reduce Lighting Levels Building 1978	306	275	182	182	-	-	-	-	-	182	-
F-9	Night Setback/Setup Barracks Building 8605 + 10 Extrapolated Buildings	11,605	10,439	2,423	-	-	-	-	2,423	-	2,423	-
F-10	Weatherstripping and Caulking, Doors and Windows, Buildings 2250, 4451	18,284	16,456	1,842	-	-	17	-	1,825	-	1,842	-
F-11	Clean Radiators, Building 4431 (Note: Not Accurately Quantifiable)	333	300	52	-	-	52	-	-	-	52	-
F-12	Zero Energy Band Thermostats Building 370	1,110	999	222	96	-	126	-	-	-	222	-
F-13	Reduce CFM, Day/Night Time Clocks, Buildings 9801 + 3 Extrapolated Buildings, 9828	29,304	26,254	5,370	-	3,087	-	-	-	2,283	-	5,370
F-14	Photo Cell Exterior Lighting Building 2793	84	75	4	4	-	-	-	-	-	4	-

F = Totals Fort Meade Buildings N = Totals NSA Buildings

4.2 INCREMENT F AND G PROJECTS FUEL SAVINGS MBTU/YR FOR EACH FUEL (Continued)

PROJECT NO.	ENERGY CONSERVATION MEASURE	TOTAL PROJECT COST ($)	INVESTMENT COST ($)	ANNUAL ENERGY SAVINGS (MBTU/YR)	ELECTRIC		GAS		OIL		TOTAL	
					F	N	F	N	F	N	F	N
F-15	Weatherstripping, Garage Doors - Wing C, Building 2246	777	699	105	-	-	-	-	105	-	105	-
F-16	Night Setback/Setup 1837F (Boiler for Buildings 1836, 1837, 1938) + 34 Extrapolated Boilers	36,890	33,215	2,196	-	-	2,196	-	-	-	2,196	-
F-17	Reduce Air Flow To Design CFM, Rebalance Building 4432	611	549	92	92	-	-	-	-	-	92	-
F-18	Reduce Outside Air, Rebalance Building 90, 4550	1,220	1,098	69	29	-	10	-	30	-	69	-
F-19	Energy Conserving Fluorescent Lamps, Various Buildings	43,216	38,904	9,534	8,386	1,148	-	-	-	-	8,386	1,148
F-20	Economizer Cycles, CPO Area and Redwood Cafe, Building 4432	5,772	5,195	763	763	-	-	-	-	-	763	-
F-21	Maintenance - Unit Heater Building 2276	166	150	6	-	-	-	-	6	-	6	-
F-22	Heat Pump for Domestic Hot Water, Building 8688	1,388	1,249	15	15	-	-	-	-	-	15	-
F-23	Remove Vestibule Radiators Building 4551	244	210	5	-	-	5	-	-	-	5	-
F-24	Weatherstrip Window Air Conditioning Unit Building 504	30	27	1	-	-	1	-	-	-	1	-
F-25	Modify Controls, Shut Off Outside Air on Warmup, 100%, Outside Air on Cool Down Buildings 4431, 4432	3,996	3,597	97	-	-	97	-	-	-	97	-
F-26	Demand Control, Building 4272	555	500	0	0	-	-	-	-	-	0	-
F-27	Replace Incandescent Lamps with Fluorescent Lamps, Various Buildings	24,843	21,707	1,864	-	-	-	-	-	-	1,864	-
F-28	High Efficiency Motor Replacement Building 4217	1,354	1,219	39	39	-	-	-	-	-	39	-

F = Totals Fort Meade Buildings N = Totals NSA Buildings

4.2 INCREMENT F AND G PROJECTS FUEL SAVINGS MBTU/YR FOR EACH FUEL (Continued)

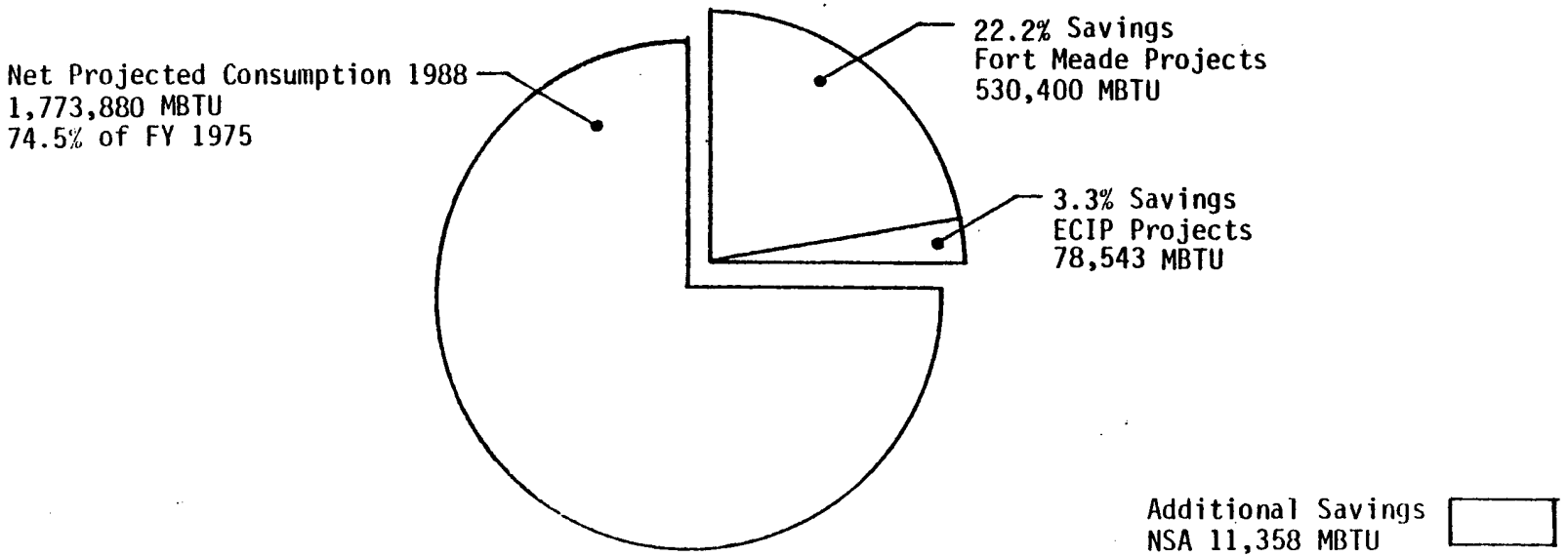
PROJECT NO.	ENERGY CONSERVATION MEASURE	TOTAL PROJECT COST ($)	INVESTMENT COST ($)	ANNUAL ENERGY SAVINGS (MBTU/YR)	ELECTRIC		GAS		OIL		TOTAL	
					F	N	F	N	F	N	F	N
F-29	Ductwork Insulation Building 4551	72	64	3	3	-	-	-	-	-	3	-
F-30	Control Domestic Hot Water Pump Buildings 370, 4411	444	400	4	4	-	-	-	-	-	4	-
F-31	Solar Film Buildings 4415, 4432	3,362	3,027	100	100	-	-	-	-	-	100	-
F-32	Insulation, Interior Ceiling and Wall, Building 2246 Arms Room	3,885	3,497	24	-	-	-	-	24	-	24	-
F-33	Modify Outside Air Vent Building 4432	910	89	*	-	-	*	-	-	-	*	-
F-34	Seal Manhole Cover Building 4551	145	131	*	-	-	*	-	-	-	*	-
F-35	Modify Intake Ductwork Building 4554	722	650	*	-	-	*	-	-	-	*	-
F-36	Repair Barometric Damper Building 726	84	75	*	-	-	*	-	-	-	*	-
F-37	Electric Outlet and Switch Energy Seals	*	*	*	*	*	*	*	*	*	*	*
	Quantifiable Grand Total	202,883	181,866	36,902	13,681	4,235	5,983	0	10,720	2,283	30,384	6,518

* Not Quantifiable
F = Totals Fort Meade Buildings N = Totals NSA Buildings

4.3 ENERGY CONSUMPTION, COST AND PERCENTAGES BY FUEL TYPE
FY 1988 VS 1975 WITH ECIP PROJECTS ACCOMPLISHED (NOT INCLUDING NSA BUILDINGS)

	FY 1975				*** PROJECTED FY 1988			
FUEL TYPE	CONSUMPTION MBTU	% TOTAL CONSUM.	ENERGY COST $	% TOTAL	PROJECTED CONSUMPTION MBTU	% TOTAL CONSUM.	ENERGY COST $**	% TOTAL
Electricity	875,689	36.8	*	*	904,886	48.5	4,117,231	33.9
Natural Gas	803,920	33.7	*	*	615,924	33.0	4,502,404	37.0
No. 2 Fuel Oil	703,246	29.5	*	*	347,840	18.6	3,537,533	29.1
	2,382,855	100.0			1,868,650	100.0	12,157,168	100.0

*** Projected 1988 1,868,650 MBTU; Projected Savings Projects Under Construction = 94,770 MBTU
Net Projected 1988 1,773,880 MBTU; Net Projected 1988 = 74.5% of 1975



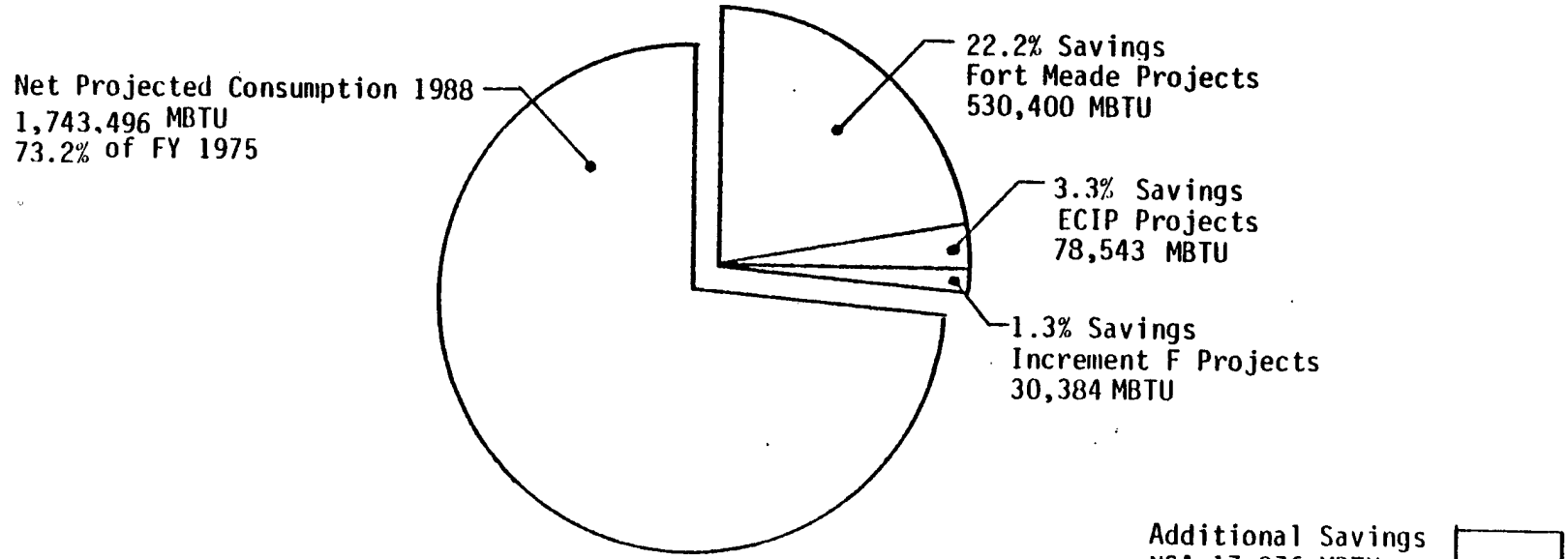
FY 1988 PROJECTED VS 1975 CONSUMPTION

* Information Not Available
** Fuel Costs Escalated from 1982 Costs
*** Not Including Savings For Projects Under Construction

4.4 ENERGY CONSUMPTION, COST AND PERCENTAGES BY FUEL TYPE
FY 1988 VS 1975 WITH ECIP & INCREMENT F PROJECTS ACCOMPLISHED (NOT INCLUDING NSA BUILDINGS)

	FY 1975				*** PROJECTED FY 1988			
FUEL TYPE	CONSUMPTION MBTU	% TOTAL CONSUM.	ENERGY COST $	% TOTAL	PROJECTED CONSUMPTION MBTU	% TOTAL CONSUM.	ENERGY COST $**	% TOTAL
Electricity	875,689	36.8	*	*	891,205	48.5	4,054,983	34.0
Natural Gas	803,920	33.7	*	*	609,941	33.2	4,458,669	37.3
No. 2 Fuel Oil	703,246	29.5	*	*	337,120	18.3	3,428,510	28.7
	2,382,855	100.0			1,838,266	100.0	11,942,162	100.0

*** Projected 1988 1,838,266 MBTU; Projected Savings Projects Under Construction = 94,770 MBTU
Net Projected 1988 1,743,496 MBTU; Net Projected 1988 = 73.2% of 1975



FY 1988 PROJECTED VS 1975 CONSUMPTION

* Information Not Available
** Fuel Costs Escalated from 1982 Costs
*** Not Including Savings For Projects Under Construction

5. INCREMENT C - SOLAR

Scope

This chapter presents Increment C, renewable energy studies, of the Energy Engineering Analysis Program (EEAP) and identifies solar energy opportunities at Fort George G. Meade.

The Energy Engineering Analysis Program (EEAP) for Increment C covers the following items:

1. Determine the feasibility of using solar and other renewable energy to supply space heating, cooling, domestic hot water or process heat. Refuse incineration is considered to be a renewable energy source, but is not included in this increment.

2. Perform a life cycle cost analysis using the Engineering Technical Letter (ETL) 1110-3-332 dated March 22, 1982.

During contract negotiations these requirements were limited to solar studies only. The solar studies are not to include space heating or cooling.

The "SOLFEAS" computer simulation program developed by the Construction Engineering Research Laboratory (CERL), COE, Champaign, Illinois was selected to perform the studies for this Contract, since it meets all

requirements and provides all components of the economic analysis. This program has recently been developed by CERL in conjunction with personnel from the Fort Worth district and contains integral weather data for 248 weather service stations known as SOLMET stations.

Results

The buildings surveyed under the Contract were categorized into groups on the basis of type of usage as follows:

Group 1 - Family Housing
Group 2 - Shops and Hangars
Group 3 - Mess Hall
Group 4 - Administration
Group 5 - Quarters
Group 6 - Laundry
Group 7 - Swimming Pool
Group 8 - Hospital
Group 9 - Other Usage

A typical building was selected for Groups 1 through 8 and monthly load profile calculated by proportioning annual load on the basis of number of days per month. The results are shown in Table 5.1.

The SOLFEAS program was then run for each building and the optimum selections from the program are summarized in Table 5.2.

As can be seen from Table 5.2, the use of solar energy for summer water heating is feasible for small contributions - 10% to 20% - of relatively large year round loads in excess of approximately 1400 MBTU/Y for gas fired systems and approximately 600 MBTU/Y for oil fired systems.

Supplementary Information

Subsequent to the original SOLFEAS calculations, it was determined that it is feasible to shut down Boiler Plant P-8481 in the summer and install local gas-fired boilers/heaters in the equipment rooms of the various buildings served by it to provide summer domestic hot water and steam as may be required. This includes Building 8605 and its ten extrapolated buildings. (Refer to Table 2.6.)

SOLFEAS, however, allows only use of one fuel to determine life cycle cost. The SOLFEAS data was, therefore, extrapolated for combination gas/oil.

Recommendations

It is recommended that such solar energy systems be provided for Buildings P-8605 (and by extrapolation from P-8605 for Buildings P-8478, P-8479, P-8543, P-8544, P-8545, P-8606, P-8607, P-8609, P-8610, P-8611, P-9801, P-9802, P-9803, P-9804, P-9827 and P-9828 - see Table 5.2 for extrapolation values), T-2250, P-6330 and P-2480 as an ECIP project.

5.1 MONTHLY MBTU LOAD PROFILE FOR TYPICAL BUILDINGS

	BUILDING							
MONTH	GROUP 1 P-3073C	GROUP 2 P-90	GROUP 3 P-2239	GROUP 4 P-1978	GROUP 5 P-8605	GROUP 6 T-2250	GROUP 7 P-6330	GROUP 8 P-2480
JAN	1.81	1.42	83.67	3.25	52.87	872.82	104.48	216.91
FEB	1.61	1.26	75.54	2.96	47.76	788.34	94.38	195.93
MAR	1.81	1.42	83.67	3.25	52.87	872.82	104.48	216.91
APR	1.75	1.37	80.97	3.15	51.17	844.66	101.11	209.92
MAY	1.81	1.42	83.67	3.25	52.87	872.82	104.48	216.91
JUN	1.75	1.37	80.97	3.15	51.17	844.66	101.11	209.92
JUL	1.81	1.42	83.67	3.25	52.87	872.82	104.48	216.91
AUG	1.81	1.42	83.67	3.25	52.87	872.82	104.48	216.91
SEP	1.75	1.37	80.97	3.15	51.17	844.66	101.11	209.92
OCT	1.81	1.42	83.67	3.25	52.87	872.82	104.48	216.91
NOV	1.75	1.37	80.97	3.15	51.17	844.66	101.11	209.92
DEC	1.81	1.42	83.67	3.25	52.87	872.82	104.48	216.91
TOTAL	21.28	16.68	985.11	38.31	622.53	10276.72	1230.18	2553.98

5.2 SOLFEAS PROGRAM SUMMARY

GROUP NO.	BUILDING	COLLECTOR AREA SQ. FT.	BASE ENERGY MBTU/Y	CONVENTIONAL FUEL	% BASE SAVED	MBTU/Y SAVED	CONSTR. COST $	MAXIMUM SIR
1	P-3073C	20	28.4	GAS	33.0	6.6	2990	*0
2	P-90	20	16.7	ELECT	39.5	6.6	2990	*0
3	P-2239	500	1313.5	GAS	20.2	265.3	12930	.962
4	P-1978	120	51.1	GAS	70.7	36.1	7500	* .066
5	P-8605	320	830.0	OIL/GAS**	20.4	169.6	16540	1.10
	Extrapolation	3200	8300.0	OIL/GAS**	20.4	1696.0	165400	
6	T-2250	2300	13627.2	OIL	10.1	1376.3	106000	2.078
7	P-6330	620	1640.2	GAS	20.1	329.7	30100	1.019
8	P-2480	580	3405.3	OIL	10.1	343.9	28290	1.824
5	P-9800 Bldgs. Extrapolated (11.82)	3780	9810.6	OIL	20.4	2004.7	195500	1.417

* Discounted Payback in Excess of 100 Years. ** See Supplementary Information

6. INCREMENT "F" - FACILITY ENGINEER CONSERVATION MEASURES

Energy Actions by Fort George G. Meade

Fort George G. Meade is to be complimented on the considerable amount of successful effort it has expended on energy conservation, as demonstrated by the results shown in the "Installation Facility Energy Plan" for fiscal years 1981 and 1983 summarized herein. The FY82 consumption represented an 18.9% reduction in energy use from the FY75 base line.

Most of the commonly known, easy to implement energy conservation opportunities -items such as storm windows, weatherstripping and caulking, insulation, etc. - have been or are in the process of being implemented at Fort Meade.

Some not so common but excellent energy conservation items have been or will be installed. This includes items such as boiler stack economizer and oxygen trim control on the two large boilers in Bulding P-8481, a waste water heat recovery system in Laundry Building T-2250, planned installation of a refrigerant compressor heat recovery system in Cold Storage Building P-4272, and an exhaust to make up air heat recovery system in NSA Consolidated Mess Building P-9829. A central Energy Management Control System was installed in 1977. A demonstration solar house is located on the Post and tests have been performed to determine energy savings available from solar energy. Additional information is shown in the charts included in Section 3 of this Executive Summary under the heading "3.1 General Summary of Potential Energy Conservation Opportunities".

Projects accomplished under OMA funds include elimination of water heaters, replacement of incandescent lighting with fluorescent lighting, improvements to combustion controls, replacement of boilers and burners, replacement of transformers and switchgear, replacement of inefficient furnaces, replacement of inefficient water heaters, reduction of interior and exterior lighting, consolidation of building space, installation of energy conserving shower inserts, and miscellaneous other energy conservation improvements.

The Fort Meade energy program also includes the following items:

- Publicity to encourage energy conservation
- Technical assistance visits to note energy deficiencies and initiate corrective action
- Energy hot line and heat line for building occupants to report energy conservation problems or to find out the current policy
- Special utility equipment permits issued to building occupants as one means to control and account for energy consumption of electrical appliances
- New construction projects review to determine if adequate provisions have been made for conserving energy

- o Controlled air conditioning/heating seasons

- o Controlled air conditioning/heating/ventilation operaling procedures

- o Domestic hot water discontinued wherever possible and controls lowered to minimum temperature setting elsewhere

- o Lighting reduction

In addition, prior to the recommendations in the Interim Phase II submission, Fort Meade combined the heating and air conditioning shops and established a separate team within the combined shop for automatic control system service and maintenance.

The tables and charts on the following five pages are reproduced from the FY83 Installation Faclities Energy Plan to summarize energy data pertinent to Fort Meade. The data shown does not include NSA facilities.

Increment A, B, C and G Projects

Table 3.3, ECIP Projects Summary Table, in Section 3 of this Executive Summary summarizes the Increment A, B, and C ECIP projects, including extrapolated buildings.

The dollar value of the Increment G items is not sufficient to warrant separate Increment G projects and these are, therefore, included in Increment F.

Increment F and G Projects

Table 6.1, Increment F and G Projects Summary Table, summarizes the recommended Increment F and G projects and Table 6.2, Increment F and G Projects Labor and Material Summary, provides breakdown information on labor and material for each project.

INSTALLATION Fort George G. Meade DATE 1 March 1983

ENERGY DATA

	MBTU FY75		MBTU FY82		PERCENT CHANGE	
	OWNED	LEASED	OWNED	LEASED	OWNED	LEASED
DEIS Facilities Energy	2,492,277	--	2,020,083	--	-18.9	--
Non-DEIS Facilities	--	--	--	--	--	--
Energy	--	--	--	--	--	--
Solar	--	--	--	--	--	--
Hydro	--	--	--	--	--	--
Refuse Derived Fuel	--	--	--	--	--	--
Wood	--	--	--	--	--	--
Other	--	--	--	--	--	--
Total Facilities Energy	2,492,277	--	2,020,083	--	-18.9	--
Total Mobility Energy	232,994	--	171,791	--	-26.3	--

INVESTMENT	#PROJECT	COST $	ANNUAL SAVINGS ($000)[1]	ANNUAL SAVINGS MBTU	YEAR SAVINGS BEGIN
...A[2]	N/A	--	--	--	--
..IP (MCA)	1	152.0	20.2	8,009	77
"	1	727.0	124.5[3]	36,743[3]	--
"	2	1,643.1	519.7	128,892	79
"	1	991.0	450 6	81,010	80
"	2	185.4	159.4	19,760	82
"	2	3,500.0	582.3	78,600	84
"	1	6,343.1	1,450.8	117,505	87
ECIP (FHMA)	2	2,357.0	190.0	65,075	82
"	1	608.0	72.4	16,170	84
"	2	7,947.3	809.6	118,698	87
PAA	0	--	--	--	--
ECAM	0	--	--	--	--
OTHER	0	--	--	--	--

1/ Annual cost savings are shown in terms of projected first year savings. Values are not escalated to reflect current fuel cost.

2/ Energy improvements are being made under CMA funded projects. However, records are not kept to separate improvement costs or savings.

3/ Data represents savings anticipated by installation of EMCS. System has been non-operational for most of the period since installation. Recent efforts to revitalize the system have restored 50% of its capacity to conserve energy.

Figure B - 1

ENERGY CONSERVATION PROGRAM

FACILITY ENERGY CONSUMPTION/OBJECTIVE - FY75 thru FY83

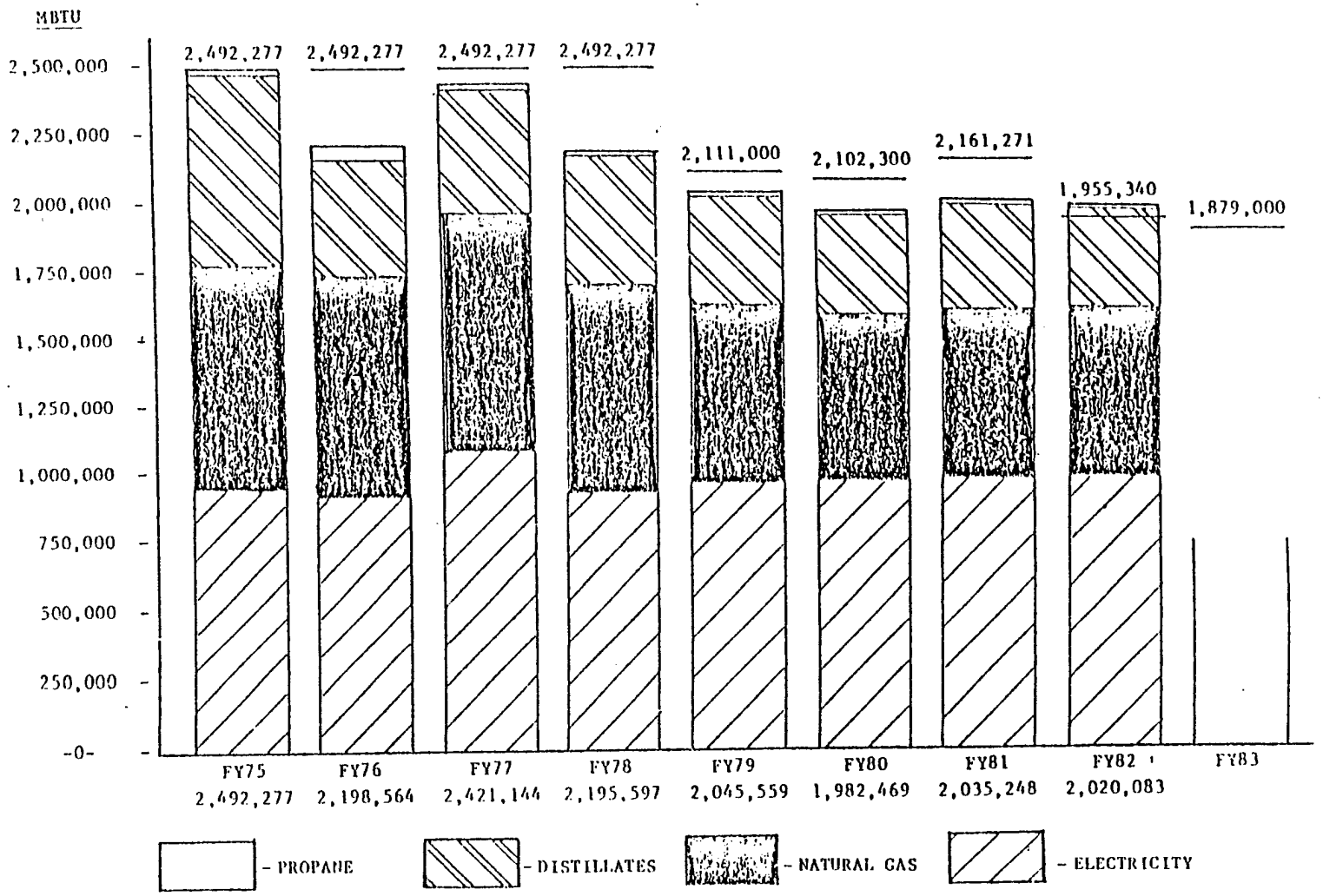


Figure - 2

ENERGY DATA

HISTORIC/GOALS

	HISTORIC								GOALS		
	FY75	FY76	FY77	FY78	FY79	FY80	FY81	FY82	FY83	FY84	FY85
ENERGY CONSUMPTION (BTU x 10^9)	2492	2274	2373	2197	2046	1982	2035	2020	1879[1]	2018[2]	2013[2]
BTU x 10^3/SF	(216.6[4] 197.8	206.7	215.7	207.3	190.9	183.6	181.7	182.0	167.8[3]	177[2]	175[2]
FACILITIES (SF x 10^6)	12.6	11.0	11.0	10.6	10.8	10.8	11.2	11.1	11.2	11.4	11.5
SAVINGS OVER FY75 (BTU x 10^9)	-	218	119	295	446	509	457	472	613	474	479

1/ Reflects FY83 Facility Energy Goal set by FORSCOM.

2/ Reflects BTU/SF Goals for Fort Meade, published in March 1981 FORSCOM Facilities Energy Plan Summary.

3/ Note that Fort Meade's FY83 goal is 4.1% less than previously projected goal for FY85.

4/ FY75 SF adjusted by FORSCOM.

E C I P P R O J E C T S T A T U S 15 MAR 83

ECIP PROJECTS COMPLETED

DESCRIPTION	PN	FY	INVESTMENT COST ($000)	ANNUAL SAVINGS ($000)	ANNUAL SAVINGS MBTU	SAVINGS BEGIN
Building insulation and Weatherstripping	997.300/ 997.302	76	152.0	20.0	8,009	77
Centralized Control System (EMCS)	997.304	76	727.0	124.5*	36,743	*
Install Floor and Ceiling Insulation	997.306 (219)	77	633.1	85.9	34,820	79
Storm windows and Building Insulation	220.20	78	1,010.0	433.8	94,072	79
Storm windows, weather-strip, Building Insulation	220.22 (221)	77	991.0	450.6	81,010	80
Family Housing Improvements (Areas 3 and 11)	882.050	80	157.0	16.2	4,122	82
Boiler Economizer	224	80	149.0	19.6	4,860	82
Laundry Improvements	228	81	368.4	139.8	14,900	82
Family Housing Improvements (Areas 1, 2, 4 thru 10)	882.070	81	2,200.0	173.8	60,953	82

TOTAL INVESTMENT TO DATE: $ 6,387,500.

TOTAL ANNUAL SAVINGS TO DATE: $ 1,464,200.; 339,489 MBTU

* EMCS has been non-operational for most of the period since installation. Recently efforts have been successful in revitalizing the system. Current savings are probably 50% of original projected savings.

E C I P P R O J E C T S T A T U S 15 MAR 83

ECIP PROJECTS UNDER CONSTRUCTION

DESCRIPTION	PN	FY	INVESTMENT COST ($000)	ANNUAL SAVINGS ($000)	ANNUAL SAVINGS MBTU	SAVINGS BEGIN
Building Energy Retrofit Phase I	226	82	3,500.0	582.3	78,600	84
Family Housing Automatic Vent Dampers	882.080	82	608.0	72.4	16,170	83

TOTAL INVESTMENT: $ 4,108,000.

TOTAL ANNUAL SAVINGS: $ 654,700., 94,770 MBTU

ECIP PROJECTS SUBMITTED FOR FUNDING

DESCRIPTION	PN	FY	INVESTMENT COST ($000)	ANNUAL SAVINGS ($000)	ANNUAL SAVINGS MBTU	SAVINGS BEGIN
Building Energy Retrofit Phase II (& Phase III)	237	85	6,343.1	1,405.8	117,505	87
Family Housing --Storm Windows and Insulation	T-454	85	2,841.4	637.7	56,012	87
Family Housing -- Insulated Siding	T-458	85	5,106.2	442.1	62,686.	87

TOTAL INVESTMENT: $ 14,290,700.

TOTAL ANNUAL SAVINGS: $ 2,485,600., 118,698 MBTU

6.1 INCREMENT F AND G SUMMARY TABLE

PROJECT NO.	ENERGY CONSERVATION MEASURE	TOTAL PROJECT COST ($)	INVESTMENT COST ($)	ANNUAL ENERGY SAVINGS (MBTU/YR)	FIRST YEAR COST SAVINGS ($)	TOTAL DISCOUNTED SAVINGS ($)	NON-ENERGY DISCOUNTED SAVINGS($)	SIR	REDUCED SIR
F-1	Reduce Domestic Hot Water Setpoint Buildings 370 and 8605 + 10 Extrapolated Buildings	192	168	1,881	16,435	186,136	0	1,108.0	-
F-2	Piping Insulation Building 8472	47	42	79	687	12,217	0	289.0	-
F-3	Adjust Controls To Reduce Overheating Buildings 2239, 2246, 4411 (not accurately quantifiable)	199	178	443	3,581	42,011	0	236.0	-
F-4	Repair Burners Building 90BH	832	749	1,144	9,978	176,017	0	234.9	-
F-5	Repair Leaks, Condensate Pump Building 8605	555	500	357	3,114	54,936	0	110.0	-
F-6	Seal Kitchen Exhaust Damper Apartment 1837F + 100 Extrapolated Apartments	2,626	2,424	3,376	20,301	199,778	0	82.5	-
F-7	Reduce Outside Air, Rebalance, Building 8605 + 10 Extrapolated Buildings	6,720	6,039	4,610	29,106	324,071	18,172	53.6	-
F-8	Reduce Lighting Levels Building 1978	306	275	182	811	10,728	4,152	39.0	31.8
F-9	Night Setback/Setup Barracks Building 8605 + 10 Extrapolated Buildings	11,605	10,439	2,423	21,131	239,217	0	22.9	-
F-10	Weatherstripping and Caulking, Doors and Windows, Buildings 2250, 4451	18,284	16,456	1,842	15,779	280,216	-2,477	17.0	-
F-11	Clean Radiators, Building 4431 (Note: Not Accurately Quantifiable)	333	300	52	312	4,278	0	14.3	-
F-12	Zero Energy Band Thermostats Building 370	1,110	999	222	1,088	13,881	829	13.9	-
F-13	Reduce CFM, Day/Night Time Clocks, Buildings 9801 + 3 Extrapolated Buildings, 9828	29,304	26,254	5,370	27,623	311,232	0	11.8	-
F-14	Photo Cell Exterior Lighting Building 2793	84	75	4	73	877	725	11.7	2.7

6.1 INCREMENT F AND G SUMMARY TABLE (Continued)

PROJECT NO.	ENERGY CONSERVATION MEASURE	TOTAL PROJECT COST ($)	INVESTMENT COST ($)	ANNUAL ENERGY SAVINGS (MBTU/YR)	FIRST YEAR COST SAVINGS ($)	TOTAL DISCOUNTED SAVINGS ($)	NON-ENERGY DISCOUNTED SAVINGS($)	SIR	REDUCED SIR
F-15	Weatherstripping, Garage Doors - Wing C, Building 2246	777	699	105	916	6,702	0	9.58	-
F-16	Night Setback/Setup 1837F (Boiler for Buildings 1836, 1837, 1938) + 34 Extrapolated Boilers	36,890	33,215	2,196	13,172	18,063	0	5.44	-
F-17	Reduce Air Flow To Design CFM, Rebalance Building 4432	611	549	92	231	2,568	0	4.67	-
F-18	Reduce Outside Air, Rebalance Building 90, 4550	1,220	1,098	69	421	4,839	182	4.41	-
F-19	Energy Conserving Fluorescent Lamps, Various Buildings	43,216	38,904	9,534	41,589	160,778	73,112	4.13	3.0
F-20	Economizer Cycles, CPO Area and Redwood Cafe, Building 4432	5,772	5,195	763	1,907	21,221	0	4.09	-
F-21	Maintenance - Unit Heater Building 2276	166	150	6	53	602	0	4.02	-
F-22	Heat Pump for Domestic Hot Water, Building 8688	1,388	1,249	15	303	3,636	3,097	2.91	0.57
F-23	Remove Vestibule Radiators Building 4551	244	210	5	32	634	0	2.88	-
F-24	Weatherstrip Window Air Conditioning Unit Building 504	30	27	1	7	65	0	2.40	-
F-25	Modify Controls, Shut Off Outside Air on Warmup, 100%, Outside Air on Cool Down Buildings 4431, 4432	3,996	3,579	97	584	8,004	0	2.23	-
F-26	Demand Control, Building 4272	555	500	0	120	1,090	1,090	2.18	0
F-27	Replace Incandescent Lamps with Fluorescent Lamps, Various Buildings	24,843	21,707	1,864	13,546	42,533	20,708	1.96	1.34
F-28	High Efficiency Motor Replacement Building 4217	1,354	1,219	39	139	1,896	499	1.56	1.52

6.1 INCREMENT F AND G SUMMARY TABLE (Continued)

PROJECT NO.	ENERGY CONSERVATION MEASURE	TOTAL PROJECT COST ($)	INVESTMENT COST ($)	ANNUAL ENERGY SAVINGS (MBTU/YR)	FIRST YEAR COST SAVINGS ($)	TOTAL DISCOUNTED SAVINGS ($)	NON-ENERGY DISCOUNTED SAVINGS($)	SIR	REDUCED SIR
F-29	Ductwork Insulation Building 4551	72	64	3	8	91	0	1.41	-
F-30	Control Domestic Hot Water Pump Buildings 370, 4411	444	400	4	51	482	376	1.21	.35
F-31	Solar Film Buildings 4415, 4432	3,362	3,027	100	344	3,642	863	1.20	-
F-32	Insulation, Interior Ceiling and Wall, Building 2246 Arms Room	3,885	3,497	24	211	3,722	0	1.06	-
F-33	Modify Outside Air Vent Building 4432	910	819	*	*	*	*	*	*
F-34	Seal Manhole Cover Building 4551	145	131	*	*	*	*	*	*
F-35	Modify Intake Ductwork Building 4554	722	650	*	*	*	*	*	*
F-36	Repair Barometric Damper Building 726	84	75	*	*	*	*	*	*
F-37	Electric Outlet and Switch Energy Seals	*	*	*	*	*	*	*	*
	Quantifiable Grand Total	202,883	181,862	36,902	223,653	2,136,343	121,328	11.74	-

* Not Quantifiable.

6.2 INCREMENT F AND G LABOR AND MATERIAL SUMMARY

PROJECT NO.	ENERGY CONSERVATION MEASURE	TOTAL PROJECT COST ($)	CONSTRUCTION COST ($)	MATERIAL COST ($)	LABOR COST ($)	LABOR HOURS	SIOH ($)	DESIGN ($)	LABOR RATE
F-1	Reduce Domestic Hot Water Setpoint Buildings 370 and 8605 + 10 Extrapolated Buildings	192	168	0	168	12	12	12	14
F-2	Piping Insulation Building 8472	47	42	13	26	34	2	3	35
F-3	Adjust Controls To Reduce Overheating Buildings 2239, 2246, 4411 (not accurately quantifiable)	199	178	0	178	13	9	12	14
F-4	Repair Burners Building 90BH	832	749	260	420	12	37	45	35
F-5	Repair Leaks, Condensate Pump Building 8605	555	500	150	315	9	25	30	35
F-6	Seal Kitchen Exhaust Damper Apartment 1837F + 100 Extrapolated Apartments	2,626	2,424	1,010	1,414	101	92	110	14
F-7	Reduce Outside Air, Rebalance, Building 8605 + 10 Extrapolated Buildings	6,710	6,050	3,960	1,100	22	297	363	50
F-8	Reduce Lighting Levels Building 1978	306	275	0	275	20	14	17	14
F-9	Night Setback/Setup Barracks Building 8605 + 10 Extrapolated Buildings	11,605	10,450	4,180	5,250	150	528	627	35
F-10	Weatherstripping and Caulking, Doors and Windows, Buildings 2250, 4451	18,284	16,473	5,766	9,266	265	823	988	35
F-11	Clean Radiators, Building 4431 (Note: Not Accurately Quantifiable)	333	300	0	300	21	15	18	14
F-12	Zero Energy Band Thermostats Building 370	1,110	1,000	400	500	14	50	60	35
F-13	Reduce CFM, Day/Night Time Clocks, Buildings 9801 + 3 Extrapolated Buildings, 9828	29,304	26,400	10,320	13,500	386	1,320	1,584	35
F-14	Photo Cell Exterior Lighting Building 2793	84	75	30	38	3	4	5	14

6.2 INCREMENT F AND G LABOR AND MATERIAL SUMMARY (Continued)

PROJECT NO.	ENERGY CONSERVATION MEASURE	TOTAL PROJECT COST ($)	CONSTRUCTION COST ($)	MATERIAL COST ($)	LABOR COST ($)	LABOR HOURS	SIOH ($)	DESIGN ($)	LABOR RATE
F-15	Weatherstripping, Garage Doors - Wing C, Building 2246	777	700	245	394	11	35	42	35
F-16	Night Setback/Setup 1837F (Boiler for Buildings 1836, 1837, 1938) + 34 Extrapolated Boilers	36,890	33,250	13,300	16,625	475	1,645	1,995	35
F-17	Reduce Air Flow To Design CFM, Rebalance Building 4432	611	550	0	550	11	28	33	50
F-18	Reduce Outside Air, Rebalance Building 90, 4550	1,220	1,110	0	1,110	22	55	65	50
F-19	Energy Conserving Fluorescent Lamps, Various Buildings	43,216	38,979	38,979	0	0	1,944	2,333	-
F-20	Economizer Cycles, CPO Area and Redwood Cafe, Building 4432	5,772	5,200	2,080	2,600	74	260	312	35
F-21	Maintenance - Unit Heater Building 2276	166	150	45	94	7	7	9	14
F-22	Heat Pump for Domestic Hot Water, Building 8688	1,388	1,250	375	780	22	63	75	35
F-23	Remove Vestibule Radiators Building 4551	244	220	10	210	6	10	14	35
F-24	Weatherstrip Window Air Conditioning Unit Building 504	30	27	12	15	1	1	2	14
F-25	Modify Controls, Shut Off Outside Air on Warmup, 100%, Outside Air on Cool Down Buildings 4431, 4432	3,996	3,600	1,440	1,800	52	180	216	35
F-26	Demand Control, Building 4272	555	500	200	250	7	25	30	35
F-27	Replace Incandescent Lamps with Fluorescent Lamps, Various Buildings	24,843	21,710	21,710	0	0	1,424	1,709	-
F-28	High Efficiency Motor Replacement Building 4217	1,354	1,220	744	320	9	61	73	35

6.2 INCREMENT F AND G LABOR AND MATERIAL SUMMARY (Continued)

PROJECT NO.	ENERGY CONSERVATION MEASURE	TOTAL PROJECT COST ($)	CONSTRUCTION COST ($)	MATERIAL COST ($)	LABOR COST ($)	LABOR HOURS	SIOH ($)	DESIGN ($)	LABOR RATE
F-29	Ductwork Insulation Building 4551	72	65	20	40	1	3	4	35
F-30	Control Domestic Hot Water Pump Buildings 370, 4411	444	400	160	200	6	20	24	35
F-31	Solar Film Buildings 4415, 4432	3,362	3,030	1,061	1,705	49	151	181	35
F-32	Insulation, Interior Ceiling and Wall, Building 2246 Arms Room	3,885	3,500	1,225	1,969	56	175	210	35
F-33	Modify Outside Air Vent Building 4432	910	820	340	385	11	41	49	35
F-34	Seal Manhole Cover Building 4551	145	130	20	105	3	7	8	35
F-35	Modify Intake Ductwork Building 4554	726	650	290	310	9	33	39	35
F-36	Repair Barometric Damper Building 726	84	75	33	42	3	4	5	14
F-37	Electric Outlet and Switch Energy Seals	NOT QUANTIFIABLE							

7. ENERGY PLAN

Recommendations

Table 3.3 of this Executive Summary summarizes the costs, savings, and economics of the ECIP projects and Tables 6.1 and 6.2 of this Executive Summary summarize Increment F and G projects. Programming documents for the ECIP projects are contained in Volume 3 of the report.

It is recommended that all projects be implemented, and done so as soon as possible, in order to maximize energy savings. Priority for implementation can be established in order of decreasing SIR, with highest SIR being accomplished first. Ultimately, however, implementation should be left to the discretion of the facility, as other implementation criteria may be involved.

For the Energy Management and Control System it is recommended that: the existing CPU should be retrofit or replaced, including a manufacturer's maintenance contract; the use of Direct Digital Control be considered when constructing new buildings or altering existing buildings; the various buildings and systems served by the EMCS be analyzed for implementation of the optimum start/stop and load reset features of the system; demand control for additional buildings and systems be considered; and consideration be given to expanding the system to serve other buildings.

Projected Energy Savings

Tables 4.1 through 4.4 of this Executive Summary summarize the potential energy savings. These indicate that for the Fort Meade facility there is a potential savings of 78,543 MBTU per year if all of the ECIP projects are implemented and 30,384 MBTU per year if all of the Increment F projects are implemented, with a grand total potential savings of 108,927 MBTU per year. These savings, coupled with the savings that were previously established as noted by comparing FY82 data with base year FY75 data, together with projected savings of 94,770 MBTU per year for ECIP projects under construction, indicate that the goal savings of 20% will be exceeded by 6.8% if all of the projects are implemented.

The Tables also indicate that for the NSA Buildings surveyed, and their extrapolations, there is a potential savings of 11,358 MBTU per year if the ECIP projects are implemented and 6,518 MBTU per year if the Increment F projects are implemented, with a grand total potential savings of 17,876 MBTU per year.

DEPARTMENT OF THE ARMY
CONSTRUCTION ENGINEERING RESEARCH LABORATORIES, CORPS OF ENGINEERS
P.O. BOX 9005
CHAMPAIGN, ILLINOIS 61826-9005

REPLY TO
ATTENTION OF: TR-I Library

17 Sep 1997

Based on SOW, these Energy Studies are unclassified/unlimited.
Distribution A. Approved for public release.

Marie Wakefield,
Librarian Engineering